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THE FOUNDRY

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JOHN A. PENTON, VICE-PRESIDENT.
A. I. FINDLEY, SECRETARY.

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TRADE OUTLOOK.

The month of November has not been marked by any radical change in the foundry situation. The price of pig iron has gone down somewhat, No. 2 Southern foundry iron being freely quoted at $9.25 at the furnace. Some buyers seem to think that the bottom has been reached, and a few large orders are being placed. An Ohio pipe works bought 12,000 tons of the lower grades and another pipe works inquiry represents 10,000 tons. The Northern furnaces have been holding their irons at higher prices and letting the Southern iron take the field, the reason for this being that all pig iron is now being sold at less than cost. It is evident that the present conditions cannot continue long and either the country at large must pay more for its supply of iron or must receive less wages for making the iron. High wages and cheap products are not compatible in this case, and it is probable that in order to steady conditions concessions will have to be made on both sides. There are more molders idle from lack of work than for several years. It is reported that in one large city there are 500 out of work. The entire situation seems to be one of caution and waiting to see what will turn up. The consumers are only ordering what castings they need for immediate use and the foundries only purchase supplies enough to keep up with current orders. A few foundries are still running overtime or increasing their capacity, but there is a marked increase of the number that are shortening hands or are shutting down altogether. To meet these conditions the blast furnaces have been curtailing their output very rapidly. With 282,000 tons active blast furnace capacity Nov. 1, based on the output in October, our pig iron production will be at the rate of 14,675,000 tons a year, or 4,000,000 tons less than the rate in September and 6,000,000 tons less than the rate in June, when the high tide was reached. This marked curtail of output cannot help but reduce the surplus stocks. At the same time the throwing of so many men out of work both at the blast furnaces and foundries is sure to bring wages down and thus decrease the cost of production. In some quarters a more hopeful spirit seems to be showing itself this month and some manufacturers believe that the bottom has been reached, and that by mutual concession any sharp reaction will be avoided and fairly prosperous conditions continued.

NATIONAL FOUNDERS' ASSOCIATION.

The National Founders' Association met in its national convention at the new Willard Hotel, Washington, D. C., on Nov. 11, the vice president, I. W. Frank, of Pittsburg, calling the meeting to order in the absence of President F. T. Towne, who has been ill for the past month. Mr. Frank spoke regretfully of Mr. Towne's absence and referred briefly to the work of the past year during which 218 labor troubles have been handled. The magnitude of the work involved, Mr. Frank said, was not generally appreciated, and there had been some dissatisfaction because the commissioner could not be in many places at once. He reminded the members that wages were not the whole question in such organizations, as many other important issues are con-

sidered. The object of the association is not to crush unions, but to do business on business principles with a business organization of workmen for the mutual benefit of the conferring organizations.

The special committees were appointed, after which the commissioner, John A. Penton, read his report, giving a comprehensive review of the relations of the association with the Iron Molders' Union in the past year. Referring to the unusual business activity of the year, he said that this has naturally given an extraordinary stimulus to the building up of labor organizations, and with the growth of the organization idea has come increased dissatisfaction among union workmen, and this has brought up many more questions for consideration than would ordinarily have come before the association. He pointed out the fact that the National Founders' Association has never assumed an extreme position with labor, but has aimed to occupy a middle ground and bring about a settlement of all cases which would be fair to both parties.

ISAAC W. FRANK.

The secretary's report was also given. The work of increasing the membership has been pushed vigorously the past year as the report shows, and the net gain after deducting withdrawals, was 56, making the present membership 536. These members employ a total of 27,242 men, this number including floor and bench molders, molding machine operators, specialty molders, coremakers, molders' and coremakers' apprentices and unskilled coremakers. The afternoon of Wednesday was given up to committee work and on Wednesday evening the annual banquet was held.

At no time has the association been more united than it is today on the objects for which it was founded, namely: "(1) The adoption of a uniform basis for just and equitable dealings between the members and their employes, whereby the interests of both will be properly protected, and (2) the investigation and adjustment, by the proper officers of the association, of any question arising between the members and their employes."

On Thursday afternoon some discussion was held in regard to the New York agreement, which is the basis of the association's conference relations with the Iron Molders' Union. No action resulted, however, and the status of the agreement remains unchanged.

Antonio C. Pessano, chairman of the committee on uniform agreement, presented at Thursday morning's session a report detailing the work of that committee, which in the past year has involved a number of conferences with representatives of the Iron Molders' Union. Thus far no definite agreement has been reached with the exception of the following resolution: "Resolved, that the wage clause of the national agreement in its application to the several districts or localities be subject to such deferentials as may be mutually agreed to by local or national representatives of the

two organizations." Some time was given to the discussion of features which the members desired embodied in a national agreement, and it was finally decided to continue the committee.

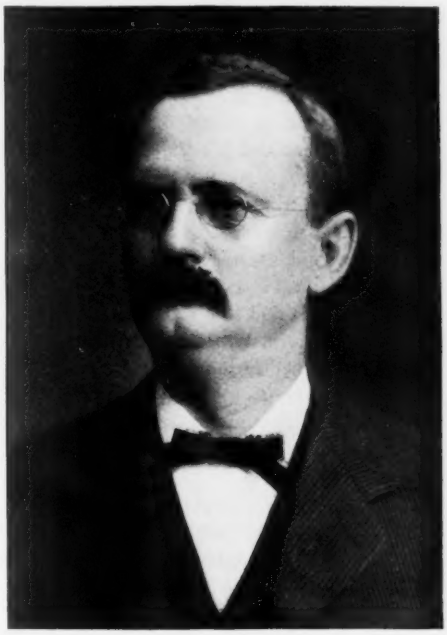
This convention marked the termination of John R. Russel's connection with the association as its treasurer, the State Savings Bank of Detroit succeeding to that office. A resolution was passed thanking Mr. Russel most cordially for his work and expressing the deep obligation the N. F. A. owes him for his faithfulness and devotion.

Resolutions expressing deep regret for President Towne's illness and hopes for his speedy recovery, and thanks for the intelligence and fidelity of his service in the past year were also passsed.

John A. Penton, the retiring commissioner of the association, received an unmistakable evidence of the esteem of the membership and the value put upon his services through the nearly six years of the association's existence. Resolutions were unanimously passed reciting his untiring work, his loyal devotion and his great personal sacrifice.

Thursday afternoon the members accepted an invitation to the White House to visit President Roosevelt.

The new officers elected are as follows: President, Isaac W. Frank, United Engineering & Foundry Co., Pittsburg; vice president, Antonio C. Pessano, Great Lakes Engineering Works, Detroit; treasurer, State Savings Bank, Detroit, Mich.; secretary, A. E. McClintock, Detroit. The following district committees were also appointed:



O. P. BRIGGS, THE NEW COMMISSIONER.

ANTONIO C. PESSANO, VICE PRESIDENT.

First District Commitee—H. A. Carpenter, A. Carpenter & Sons Foundry Co., Providence, R. I., chairman; Geo. H. Gibby, Condor Iron Foundry Co., Boston, vice chairman; F. B. Farnsworth, McLagon Foundry Co., New Haven, Conn.; P. D. Wanning, Birmingham Iron Foundry, Derby, Conn.; David Hunt Jr., Baush Machine Tool Co., Springfield, Mass.

Second District Committee—H. Van Atta, J. L. Mott Iron Works, New York, chairman; James McNaughton, American Locomotive Co., Schenectady, N. Y., vice chairman; R. C. Oliphant, Trenton Malleable Iron Co., Trenton, N. J.; F. E. Wheeler, International Heater Co., Utica, N. Y.; H. W. Wendt, Buffalo Forge Co., Buffalo, N. Y.

Third District Committee—W. S. Hallowell, Harrison Saftey Boiler Works, Philadelphia, chairman; W. H. McFadden, McIntosh, Hemphill & Co., Pittsburg, vice chairman; Howard Carlton, South Baltimore Foundry, Baltimore; B. J. Walker, Erie Malleable Iron Co., Erie, Pa.; John E. Harbster, Reading Hardware Co., Reading, Pa.

Fourth District Committee—J. D. Leary, Queen City Foundry Co., Cincinnati, chairman; W. D. Sayle, City Foundry Co., Cleveland, vice chairman; H. J. Boggis, Taylor & Boggis Foundry Co., Cleveland; C. H. Morgan, Morgan Engineering Co., Alliance, O.; H. C. Ryding, Lorain Foundry Co., Lorain, Ohio.

Fifth District Committee—H. K. McLean, Link Belt Machinery Co., Chicago, chairman; C. R. Stephens, Moline Plow Co., Moline, Ill., vice chairman; Ferd. Schwedtmann, Magnetite Foundry Co., St. Louis; John L. Ketcham, Brown-Ketcham Iron Works, Indianapolis, Ind.; Robert Vierling, Vierling, McDowell & Co., Chicago.

Sixth District Committee—Irving H. Reynolds, Allis-Chalmers Co., Milwaukee, chairman; C. M. Power, St. Paul Foundry Co., St. Paul, vice chairman; T. J. Neacy, Filer & Stowell Co., Milwaukee; O. B. Kinnard, Kinnard-Haines Co., Minneapolis; H. M. Wallis, J. I. Case Plow Works, Racine, Wis.

Seventh District Committee—W. F. Angus, Montreal Steel Works, Montreal, chairman; Frederick Nicholls, Canada Foundry Co., Ltd., Toronto, vice chairman; Chas. H. Carrier, Carrier, Laine & Co., Levis, Que.; H. Cockshutt, Cockshutt Plow Co., Ltd., Brandford, Ont.; R. J. Whyte, Frost & Wood Co., Smith's Falls, Ont.

Eighth District Committee—E. Van Winkle, E. Van Winkle Gin & Machine Works, Atlanta, Ga., chairman; W. D. Tynes, Hardie-Tynes Foundry & Machine Co., Birmingham, Ala., vice chairman; A. D. Schofield, J. S. Schofield's Sons Co., Macon, Ga.; A. A. DeLoach, De Loach Mill Mfg. Co., Atlanta, Ga.

The New President.

Isaac W. Frank, of Pittsburg, who was elected president to succeed F. T. Towne, of Stamford, Conn., has taken an active interest in the National Founders' Association since its organization, having been a member of the executive committee every year, last year vice president and for five years either chairman or vice chairman of the third district. The Frank-Kneeland Machine Co., of which he was president at the time of the organization of the association, is one of the charter members. Mr. Frank was born on Dec. 7, 1855, at Pittsburg, Pa. He was educated at the Rensselaer Polytechnic Institute of Troy, N. Y., and for four years was engaged in civil and mechanical engineering. In 1880 he became secretary and chief engineer of Lewis Foundry & Machine Co., of Pittsburg, and in 1892 organized the Frank-Kneeland Machine Co., becoming its president. He continued to serve in this capacity until the organization of the United Engineering & Foundry Co., of Pittsburg, in 1901, when he was elected president and continues to serve in this capacity. This company is a consolidation of the Frank-Kneeland Machine Co., McGill & Co., Lincoln Foundry Co., of Pittsburg, Pa., and the Lloyd Booth Co., of Youngstown, O., and the Chilled Roll Foundry Co., of Apollo, Pa., Mr. Frank's other interests are extensive, and his acts of charity, bestowed with modesty, are legion.

The New Commissioner.

After the adjournment of the convention the new administrative council, which is composed of the officers of the association and the chairman and vice chairman of the various district committees, held a meeting and elected O. P. Briggs, of Minneapolis, Minn., as commissioner, to succeed John A. Penton. Mr. Briggs is a native of Livermore, Me., and received his education in the schools of Maine. He went to Minnesota in 1877 and took a position as clerk in the office of the Minnesota Iron Works, Minneapolis, which operated a jobbing machine shop and foundry, the plant being one of the first metal working establishments in the State. He remained with that concern and the Pray Mfg. Co., its successor, until 1886, when he started the Twin City Iron Works, for the manufacture of engines and power transmission machinery. The business continued under that name until the spring of 1902, when plans were made for the enlargement of the plant and for the entrance of new capital into the business. The name was changed to the Minneapolis Steel & Machinery Co., with J. L. Record as president, Geo. Gillette vice president, O. P. Briggs treasurer, and Ralph Gillette secretary. The company employs 600 men and this year built a new machine shop, foundry, structural shop and woodworking department. It is capitalized at $750,000 and its lines of manufacture are Corliss engines, power transmission machinery, structural iron work, bridges and building construction.

Mr. Briggs' broad experience in manufacturing and shop management has well fitted him for the problems to be handled in his new office. He has actively participated in the work of the National Founders' Association as well as in that of the National Metal Trades Association and brings to the discharge of his duties

the executive faculty as developed in the school of affairs. He will make his headquarters in the Hammond building, Detroit, in which the offices of the commissioner have been maintained heretofore.

Retirement of Commissioner Penton.

The Washington convention marked the end of one era in the history of the National Founders' Association, since with its adjournment Commissioner John A. Penton terminated his connection with the association. Mr. Penton has been the moving spirit of the association from its beginning. There have been able and wise leaders in the presidential chair throughout the six years, but Mr. Penton was the early propagandist of the association idea and went about the country enlisting foundrymen in the movement when skeptics were many and when men with the discernment and courage to ally themselves with an employers' organization for the working out of foundry labor problems could readily be counted. Serving first as secretary of the American Foundrymen's Association, which had done and is still doing a good work in substituting certainty for haphazard in foundry practice, Mr. Penton has become better known to the foundry trade of the United States than any other man, and his name has become linked with that trade in a peculiar way.

Some months ago he expressed a desire to be relieved from the arduous duties of the commissioner's office, and the administrative council, after finding that Mr. Penton's decision was unalterable, appointed a committee to find his successor. As a result of that committee's work O. P. Briggs, of Minneapolis, now takes up the work.

At a banquet of the official alumni of the organization—those who have served on the administrative council in any year—held at the New Willard hotel Tuesday night, Nov. 10, Mr. Penton's closest associates in the work of the past six years expressed their appreciation of what he has done. O. P. Letchworth, in behalf of the banqueters, presented Mr. Penton with a bound volume of letters from his friends. Each of these letters was mounted on parchment and contained an expression of appreciation of the recipient's service in behalf of the association. Mr. Letchworth at the same time gave Mr. Penton, on behalf of these friends, a diamond ring with three stones, accompanying the presentation with feeling words of thanks, of regret and of regard.

It was an occasion that told far more than words can express of the warmth and permanence of the friendships made and cemented in the burden and heat of the service rendered by the leaders of this association. It would be difficult to duplicate these relations in any organization doing similar work.

The Banquet.

The annual association banquet was given on Wednesday evening at the New Willard and there was the usual accompaniment of music, furnished on this occasion by an orchestra and a male quartette. The menu cards were unique, being in the form of a stock certificate. It certified that the bearer was "the owner of one first-class appetite, non-assessable, and 100 shares of the capital stock of the banquet of the National Founders' Association at the New Willard Hotel, Washington, D. C., transferable only under the laws of nature and to be satisfied upon personal presentation, accompanied by a health certificate properly authenticated and recorded in the book of good fellowship. The certificates were signed by F. T. Towne, president, and A. E. McClintock, secretary, of the association, and bore the N. F. A. seal. On the back of the certificate was a group portrait of the six past presidents—W. H. Pfahler, P. W. Gates, O. P. Letchworth, H. W. Hoyt, W. D. Sargent and F. T. Towne—and underneath the legend, "The mildest manners with the bravest minds." The menu was interlarded with the terminology of the foundry and included among other things, fluor spar oysters, strained clay wash, gate pin asparagus with analysis sauce, and low silicon cheese. After the coffee "cupola stacks" were passed.

Stanley G. Flagg, of Philadelphia, as toastmaster, voiced the regret of all at the absence of the association's president and the first toast was drunk to the health of Mr. Towne, who was reported to be making a good recovery.

H. N. Covell was called on to express the association's appreciation of Mr. Towne's services and concluded his remarks by exhibiting a beautiful silver service of six pieces, with server—the gift of the membership to its retiring president. The service, which is the work of Gorham, is in French gray finish, and the art work, notably rich, following no conventional design. On the server is the inscription, "Presented to Frederick Tallmadge Towne, by the National Founders' Association,

as a token of its appreciation of his services as president, 1902-1903."

The other banquet speakers were: E. F. Du Brul, commissioner of the National Metal Trades Association; Wm. H. Pfahler, of Philadelphia; O. P. Letchworth, of Buffalo; Geo. W. Cope, of the *Iron Age;* A. I. Findley, of The *Iron Trade Review;* J. H. Webster, of Cleveland; and the incoming president, Isaac W. Frank.

The attendance of the meeting was very full and it was marked by special interest in all the concerns of the association.

Meeting of the American Society of Mechanical Engineers.

The annual meeting, being the 48th meeting, of the American Society of Mechanical Engineers, is to be held in New York City, Dec. 1 to 4. The first session will be held Tuesday evening, Dec. 1, when the president's address will be made. The second session, Wednesday morning, at the Hall of the Mendelssohn Union, 113 West Fortieth street. Wednesday afternoon will be given up to visiting the plants of the Interurban Street Railway Co., the Manhattan Elevated Railway Co. and the New York Edison Co. Thursday morning there will be a session at Stevens Institute of Technology, Hoboken, N. J., and the afternoon will be given up to inspecting the university. Thursday evening the annual reception will be held at Sherrys. Friday the closing session will be held in the Society House, 12 West Thirty-first street. Friday afternoon there will be an excursion to the works of the DeLaval Steam Turbine Co., Trenton, N. J.

Philadelphia Foundrymen's Association.

The 132d meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, in Philadelphia, on Wednesday, November 4, President Thomas Devlin occupying the chair. The treasurer reported a balance of $1,949.61 in the treasury and all bills paid. The officers for the ensuing year, nominated at the previous meeting, were elected. With three exceptions the old officers were re-elected. The following are the names of the officers for the coming year: President, Thomas Devlin, of the Thomas Devlin Manufacturing Co., Philadelphia; vice president, A. E. Outerbridge, of Wm. Sellers Co., Philadelphia; treasurer, Josiah Thompson, of J. Thompson & Co., Philadelphia; secretary, Howard Evans, of J. W. Paxson Co., Philadelphia; executive committee, Thomas M. Eynon, of Eynon-Evans Mfg. Co., Philadelphia; R. C. Oliphant, of the Trenton Malleable Iron Co., Trenton, N. J.; T. B. Harkins, of T. B. Harkins & Co., Bristol, Pa.; and H. O. Evans, of Thomas Devlin & Co., Philadelphia; trustees, Thomas Devlin, Josiah Thompson and Howard Evans; official chemist, George C. Davis, Philadelphia.

The paper of the evening was presented by James H. Ritter, of the Biddle Hardware Co., Philadelphia, the subject being "Penn and his City." The paper was historic, descriptive and commercial in character. It was illustrated by about 50 lantern slides and was very interesting. Following the paper there was a general discussion on the foundry trade by the members. After the adjournment of the general meeting the members sat down to the usual luncheon, after which speech-making was indulged in and an opportunity taken to welcome D. G. Moore, who had just returned from a trip to China, Japan and the Philippine Islands. He gave a very interesting description of the foundries and shops he visited in those places.

The S. Obermayer Company's 30th Anniversary.

A special edition of the Obermayer Bulletin was gotten up in honor of the 30th anniversary of the S. Obermayer Co. It contains illustrations of the factories, offices and warehouses of the company, together with pictures of the officers and salesmen and considerable matter of general interest concerning the company and its history. The growth of the company is followed from its establishment by the late Simon Obermayer and the various phases of its growth are treated. It handles everything needed in the foundry covering both equipment and supplies, and the Obermayer Bulletin published by the company is always full of interesting matter.

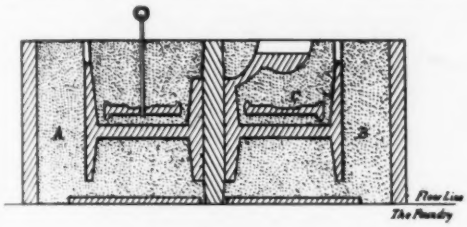
Indianapolis Division of the Foundry Foremen's Association.

Another branch of the Foundry Foremen's Association has been formed in Indianapolis, and nearly every foundry foreman in the city is a member. The officers are: M. Barmore, President; W. Holmes, secretary; John Reynolds, treasurer.

AN OPEN-SAND PULLEY MOLD.

BY E. H. POWELL.

The advantages of the mold here described lie in the fact that it can be used without a complete pattern; it is self-venting and allows inspection of the part where dirt is apt to collect during molding. When a rush order comes in for some pulley and there is no pattern on hand that can be used, it is necessary to save all the pattern-making time possible. If there is no hub pattern that can be used it is necessary to make one and also patterns for



AN OPEN-SAND PULLEY MOLD.

the arms, unless these are to be made in cores, when it will be necessary to make a core box for the arms. If time permits, a section of the rim can also be made and used to advantage, but it is not necessary. The arms can be left separate or they can be fastened to the hub.

A sectional view of the mold is shown in the accompanying figure. A plate for a sweep center is placed on the floor and a bed of sand an inch or so deep placed upon it. A cheek flask is placed on this and sand rammed up in it, leaving an open center of any convenient diameter smaller than the pulley to be made. This open center may be formed by using any cylindrical block or pattern that may be at hand. The sand in the cheek should be about 1½ to 2 inches deeper than the width of the rim of the pulley. After removing the pattern used to form the central opening, a sweep spindle and sweep are placed in position and the outside of the rim is swept to the desired diameter. Small pieces of wood having the thickness of desired rim and about one inch wide are placed around inside of the mold and the hub and arm patterns set in place. Sand is then rammed around to the parting line in the usual manner, tucked up under the arms and a parting made along the line A B. Sand is then packed over the arms to a depth of about ¾ inch and a lifting crab placed on this sand, provision being made in the lifting crab for three draw irons by means of which the upper portion of the mold can be removed. Sand is then rammed up to the desired height and a pouring basin formed.

The central portion of the mold is lifted out by means of the crab and lifting irons, the strips of wood removed, and any necessary patching or filleting done. The center piece is then put back, care being taken to see that the arms match. An ordinary core is used for forming a hole through the hub and is set before the center piece is replaced. The center of the mold will have to be weighted, but as the lifting action is largely eliminated, it does not require so much weight as a closed mold.

When pouring the pulley enough metal should be added to make the rim about 1½ inches higher than the top edge so that this extra metal can be cut off in the machining, thus insuring sound metal in the face of the pulley.

Recovery of Nickel from Scrap Anodes.

BY A. K. BECKWITH, DOWAGIAC, MICH.

Abstract from paper read before the American Foundrymen's Association at Milwaukee, June, 1903.

While it is the usual practice to melt scrap nickel anodes in the crucible, our company fitted up a cupola for the purpose. As nickel is more infusible than iron naturally more coke is consumed and the charges must be made accordingly. We use a ratio of one to one for the bed, and two and one half to one for the charges. The following is the result of one run which required two heats, the total amount of scrap melted being 875 pounds.

The scrap was worth $218.75, the coke used was 640 lb., valued at $2.25, molder's time $3.00, labor $2.00, or total cost $226.00.

The yield was 635 pounds of nickel anodes, which at 50 cents a lb. made $317.50, then 75 lb. scrap worth $18.78, making a profit on the operation of $110.25.

The business of the old firm of H. R. Ives & Co., Montreal, has been taken over by The H. R. Ives Co., Ltd. Capital $350,000. R. H. Ives is president, and Samuel Coulson vice president. It employs about 500 men and makes architectural iron and bronze work, and brass and iron bedsteads.

The Cullen-Johnson Brass Mfg. Co., Toronto, Canada, has been incorporated with a capital of $40,000. The directors are: F. N. Cullen, H. E. Johnson and Wm. Meen.

GENERAL VIEW OF FOUNDRY FROM THE SOUTH.

West Allis Foundry of the Allis-Chalmers Company, Milwaukee, Wis.

The works at West Allis were laid out with the idea of having everything move in a continuous line from start to finish. The works were designed and a piece of property secured to fit them. The erecting shop, where the finished product is assembled, was taken as the backbone of the system. This is a long shop which is intended to run the length of the east side of the property. From this shop there are a series of bays extending partially across the property. These are occupied by machine shops, blacksmith shop, power station, etc. At present only three of these bays have been built, two of them being occupied as machine shops and the third as power station and blacksmith shop. Between the bays are yards for the storage of castings. These yards are served by traveling cranes. Parallel with the erecting shop and across the ends of the bays is the foundry yard for the storage of heavy flasks and finished castings. Parallel with the foundry yard is the foundry and next to it is the supply yard where the coke, coal, pig iron, sand and other supplies are received, and at the farther side of the supply yard next the west property line and also parallel with the foundry and the erecting shop are the pattern shop and pattern storage. All the buildings running parallel with the property have been constructed with temporary ends at the north, it being the intention to extend them as it is found necessary to increase the capacity of the plant. The foundry building is 566 feet long by 220 feet wide.

GENERAL VIEW OF FOUNDRY FROM THE SOUTH.

Handling of Supplies.

As the foundry itself is the subject of this article we will follow the material and supplies through this department from the raw material to the finished castings. The sand is received on an elevated track running the entire length of one side of the foundry. It is shoveled from the cars into elevated bins inside the foundry building, the sand for different purposes being kept at different places in the building. At the south end of the foundry opposite the loam floor are arranged the mud mills for preparing the loam mixture. At the other end of the foundry above the core department is placed the sand mill for mixing and screening the core and other sand. Regular molding sand is drawn from the bins through chutes at intervals along the side of the building.

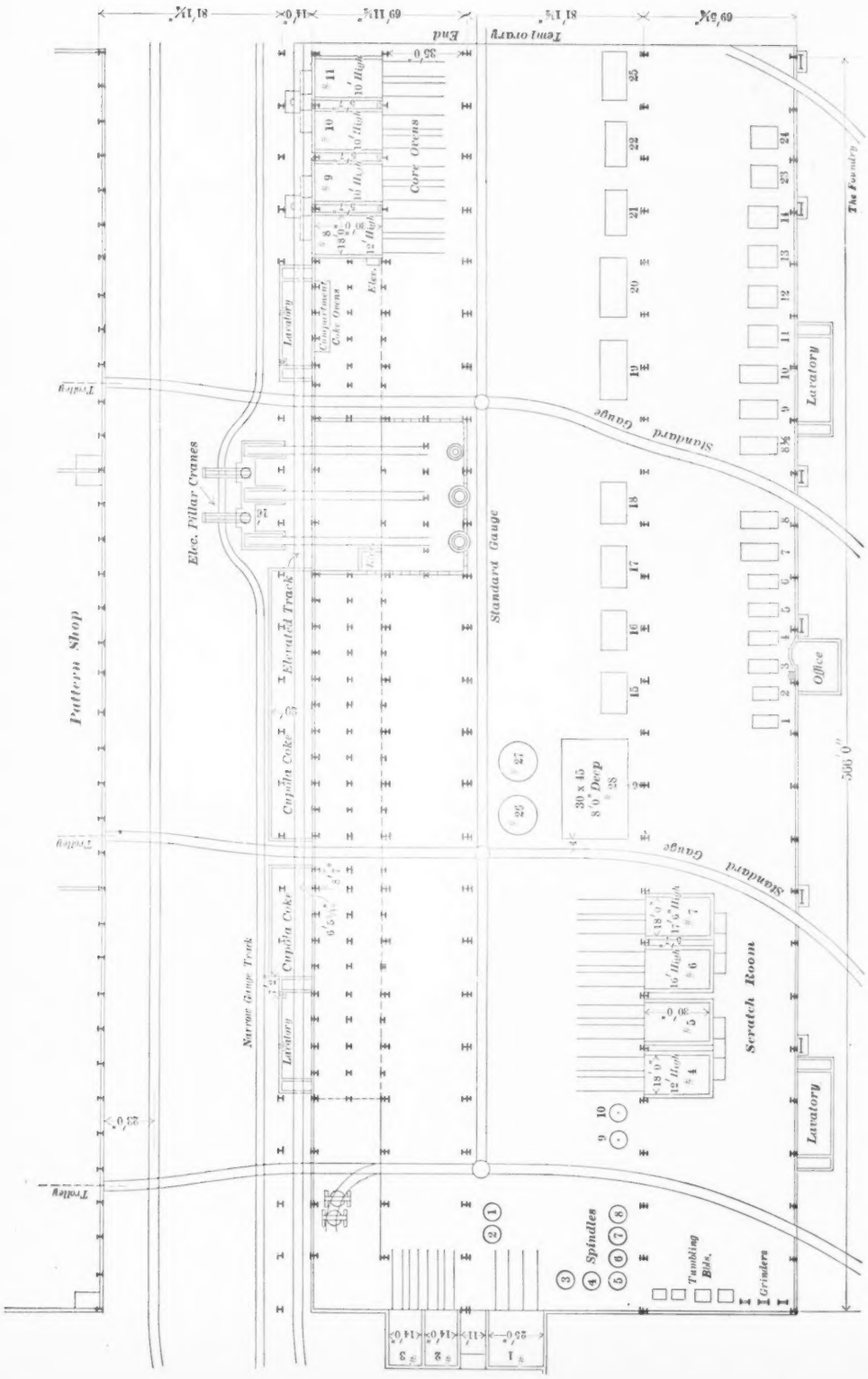
Part of the coke is delivered into the bins from the elevated tracks and part of it into piles from the surface track. The pig iron is all delivered from the surface track. A Pawling & Harnischfeger traveling crane of 10-tons capacity, having a span of 80 feet and a lift of 24 feet, is used for handling material in the yard. This crane has a travel along the yard of 542 feet. The cranes are all electrically operated, a 220-volt direct current being used. The yard crane is provided with a covered trolley and an enclosed cage. The coke and iron for the cupola charges are delivered, in skip boxes, to a point near the cupola inclines either by the traveling crane or the narrow gauge railway which extends the length of the foundry yard. If the skip boxes are delivered by the traveling crane, the charge is weighed by scales supported from the crane hook; if the charges are made up on the narrow gauge railway, the skips are carried upon scale cars and the charges weighed in this manner. At the foot of the inclines for the cupola skips are two pillar cranes made by the Northern Engineering Works, Detroit, Mich. These cranes are of the three motor type and are provided with enclosed cabs. The traveling crane arranges the skip boxes around the pillar cranes and they serve the skips as required.

The Charging Apparatus.

The cupolas are charged by means of automatic dumping skips. The skip boxes, which have been loaded in the yard are delivered to the pillar cranes by the traveling crane or the scale trucks, are placed on the carriage on the incline leading to the cupola which is to receive the charge. The skip is then hoisted up the incline and the charge dumped into the cupola by the automatic contrivance at the top. This arrangement is clearly snown in the accompanying illustration. In the case of the cupolas little or no handling of the charge is required as both coke and iron can be dumped directly from the skip and will level themselves with sufficient accuracy.

Cupolas.

There are three cupolas, two of which are 72 inches inside the lining and the third, 48 inches. They are arranged midway the length of the building and stand in a room separated from the foundry proper. The cupola spouts project through the brick wall into the foun-



PLAN OF FOUNDRY.

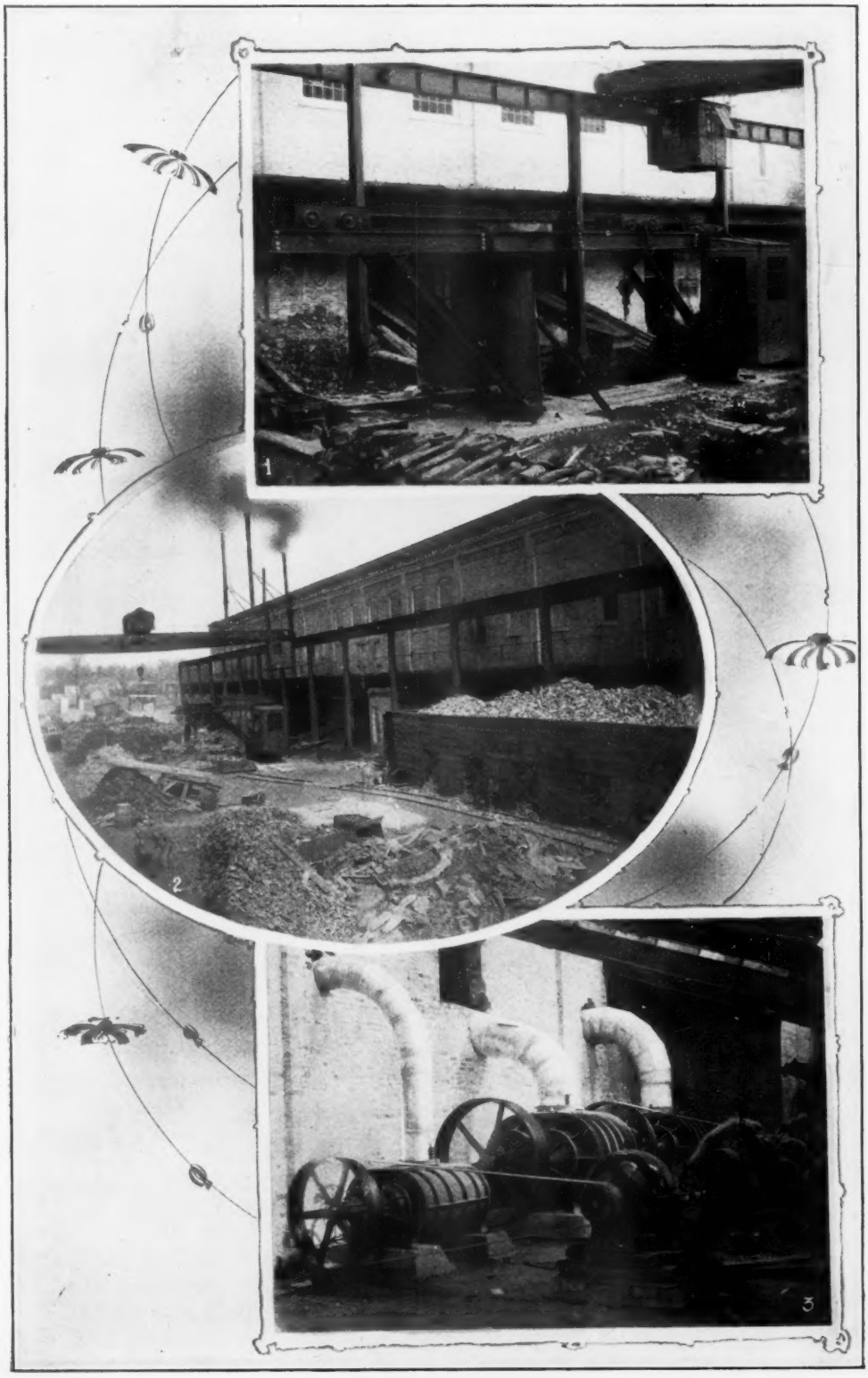
dry as shown in the accompanying illustration. The slag from the cupola is caught in a steel slag cart and removed. A special winch is placed in the blower room adjoining the cupola room and connected with a series of chains so that it can be used for drawing the props from under the cupola bottoms as shown.

The blowers are situated in a room back of the cupola room and under the inclined skips. Each blower is driven by its own electric motor. A platform elevator is arranged to deliver any supplies which may be required either at the floor on a level with the sand bins or on the charging floor. Ordinarily two cupolas are used at a time. It would be possible to get the tonnage ordinarily required from one large cupola, but on account of the small finished work they get better results by running the small cupola for that purpose only.

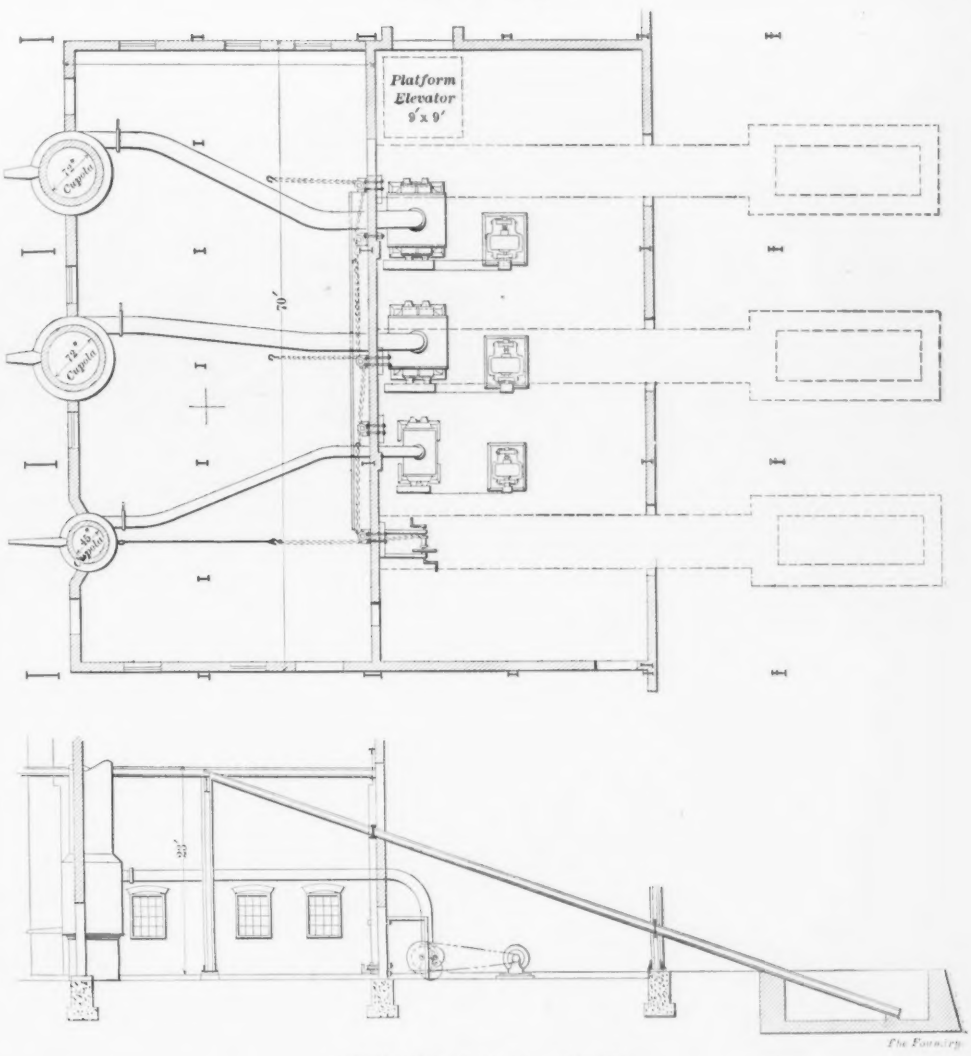
The Foundry.

The foundry proper consists of three parallel bays. The central bay is provided with one Shaw traveling crane of 60-ton capacity with 15-ton auxiliary hoist and two Pawling & Harnischfeger traveling cranes of 40-ton capacity equipped with 10-ton auxiliary hoists. The span is 78 feet, the lift 33 feet, and the run-way 566 feet. Under these cranes at each side are arranged a series of Pawling & Harnischfeger wall cranes of 5-ton capacity. There is one of these cranes on each side of the foundry. The hook has a travel of 20 feet from the wall by the entire length of the foundry, and a lift of 21 feet, the run-way of these cranes being entirely independent of the run-way, for the main cranes enables them to pass beneath the main cranes and work with or independent of the other system. In the bays there are several Pawling & Harnishfeger traveling cranes as follows: One 30-ton with an auxiliary hoist of 7½ tons, 66 feet span, 25 feet lift and 566 feet run-way. This is in the east bay. In this bay there are also two 20-ton cranes with 5-ton auxiliary hoist. In the other bay there are two 20-ton cranes with 5-ton auxiliary hoist having a span of 35 feet, a lift 20 feet and 5 inches, and a 320-foot run-way. There is also a wall crane with 2½ tons capacity with a hook radius of 20 feet and a run-way of 330 feet. In the west bay near the loam floor there is also a small electric jib crane used for handling the cores on the trucks. In handling the iron from the cupolas the traveling cranes in the main bay handle the heavy ladles and do the pouring in the center of that bay. Sometimes a ladle is taken across the bay and delivered to the wall crane on the east side and handled by it. The wall crane on the west side handles all the small ladles around the cupolas and also the iron for the small work cast in the bay between the loam core department and the cupolas. The work on this floor is practically all poured from shank ladles. The wall crane carries a ladle holding about three tons to a small hand jib crane secured to one of the posts opposite this floor and leaves it on the jib crane to supply the molders with iron for their shank ladles. When the large ladle is emptied it is returned to the cupola by the wall crane.

Owing to the fact that the Allis-Chalmers Co. has several foundries in Milwaukee, they have specialized the work at the West Allis foundry. The fly wheels, crank discs and everything that goes on the crank shaft of an engine are cast at another foundry. This leaves simply the frames, cylinders, motion work and similar castings to be made at the West Allis foundry. The small work is all handled in the bay between the cupolas and the loam core department as already mentioned. One end of the main bay is devoted entirely to sweep work, there being ten permanent spindles arranged on this floor and special spindles in the center for large work, the other half of the main bay is devoted to heavy floor work and pit work. There are 29 permanent pits lined with cement and arranged in various parts of the main and east bays. The largest of these pits, No. 28, is 30 x 40 feet by 8 feet 6 inches deep. It is shown very plainly in one of the views taken near the middle of the foundry. There are twelve core ovens situated in various parts of the foundry. Three large ovens are located outside of the south end of the foundry adjacent to the loam spindles and are used for baking loam molds. The mud mills and loam core department are situated in the west bay beyond the light work floor. Near the center of the foundry in the east bay another group of core ovens are arranged which are used for baking large cores or pieces of loam work either from the sweeps on the loam floor or from the heavy work floor. At the north end of the biulding there is another group of large core ovens arranged on the side next the stock yard and fired from outside of the building. The furnaces for these ovens are shown in one of the views of the stock yard. The core department is situated



1.—PILLAR CRANES FOR PLACING SKIP BOXES ON INCLINES. 2.—VIEW IN STOCK YARD. 3.—BLOWER ROOM



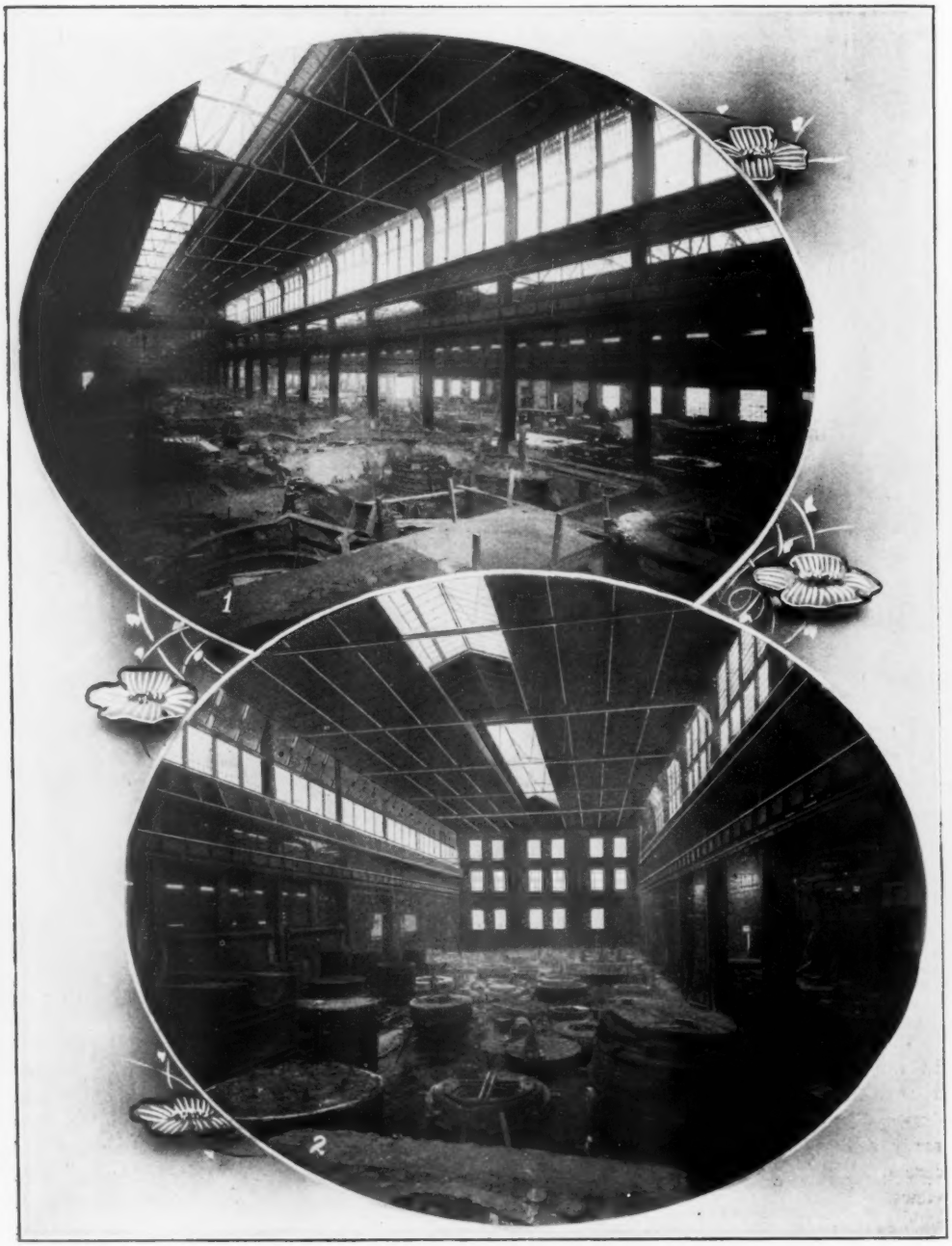
CUPOLA CHARGING ARRANGEMENT.

in the north and south ends of the west bay. In this department there are also arranged a series of sectional ovens provided with drawers. The sand mixing machine already referred to is in the gallery above the core department and is shown in one of the views.

Special Appliances for Making Tools.

In most shops the loam molders are allowed to make their own tools. If this custom were followed in a large foundry like that of the West Allis Foundry, it would require a very large space to keep the men supplied with tools; hence they devote a portion of the floor in the east bay of the foundry, and a smaller portion in the west bay to the making of loam tools. At these floors heavy iron rails are let in at each edge, and the man in charge makes up a bed covering the entire area about 20 x 40 feet in the case of a larger floor. This bed is struck off with long straight edges and the tools to be molded are then bedded in. The permanent straight edges insure a level bed, and the making up of the entire bed at once reduces the amount of work necessary upon it to a minimum.

A foundry of this size must necessarily use a very large number of gaggers and core irons and hence they make special provision for casting these. Two of the gagger molds are shown in one of the illustrations. They are similar in design to the cast iron chills already



1. NORTH HALF OF FOUNDRY WITH CASTING PITS IN FOREGROUND. 2. SOUTH HALF OF FOUNDRY SHOWING LOAM FLOOR.

described in the foundry and used for this purpose, but in some respects their construction is unique. They are supported by trunnions on opposite corners, made hollow, and water is flowed through them to carry away the excess heat. They are used continually from the time the heat starts until the time the blast is taken off, the gaggers being wheeled away in iron wheelbarrows. The core bars are made in similar water cooled chills, there being two

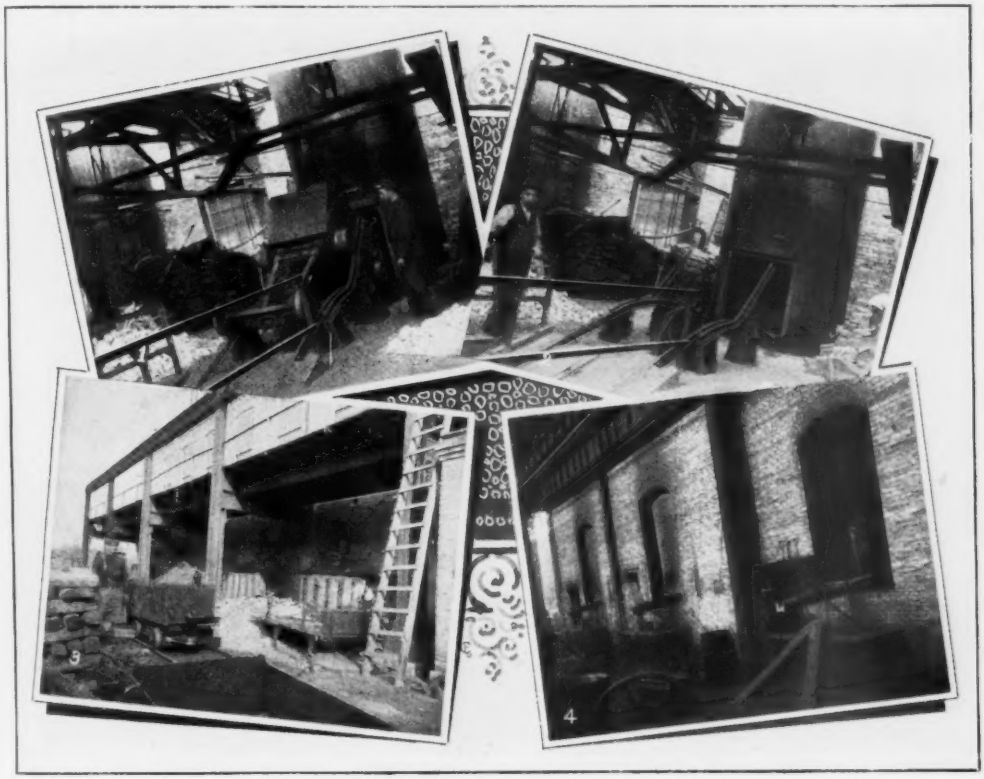
sets of molds, one for slender bars and one for heavy bars.

The Scratch Room.

The scratch room is located in the south end of the east bay. Owing to the fact that a comparatively small amount of small or light work is cast in the foundry, the main part of the cleaning is done by hand. This department, however, is equipped with four exhaust tumbling barrels, several grinding stands, pneumatic hose for operating chipping hammers, core rod straightener and other necessary tools. The from the castings is put through a shaking sieve driven by an electric motor so as to remove all core rods and other pieces of iron. After being cleaned the castings are either stored in the yards between the bays of the machine shop, or are taken directly to the machine shop.

Heating and Sanitary Provisions.

All of the buildings of the plant are heated by hot water, the hot water being circulated through the coils by means of a circulating pump in the power house.

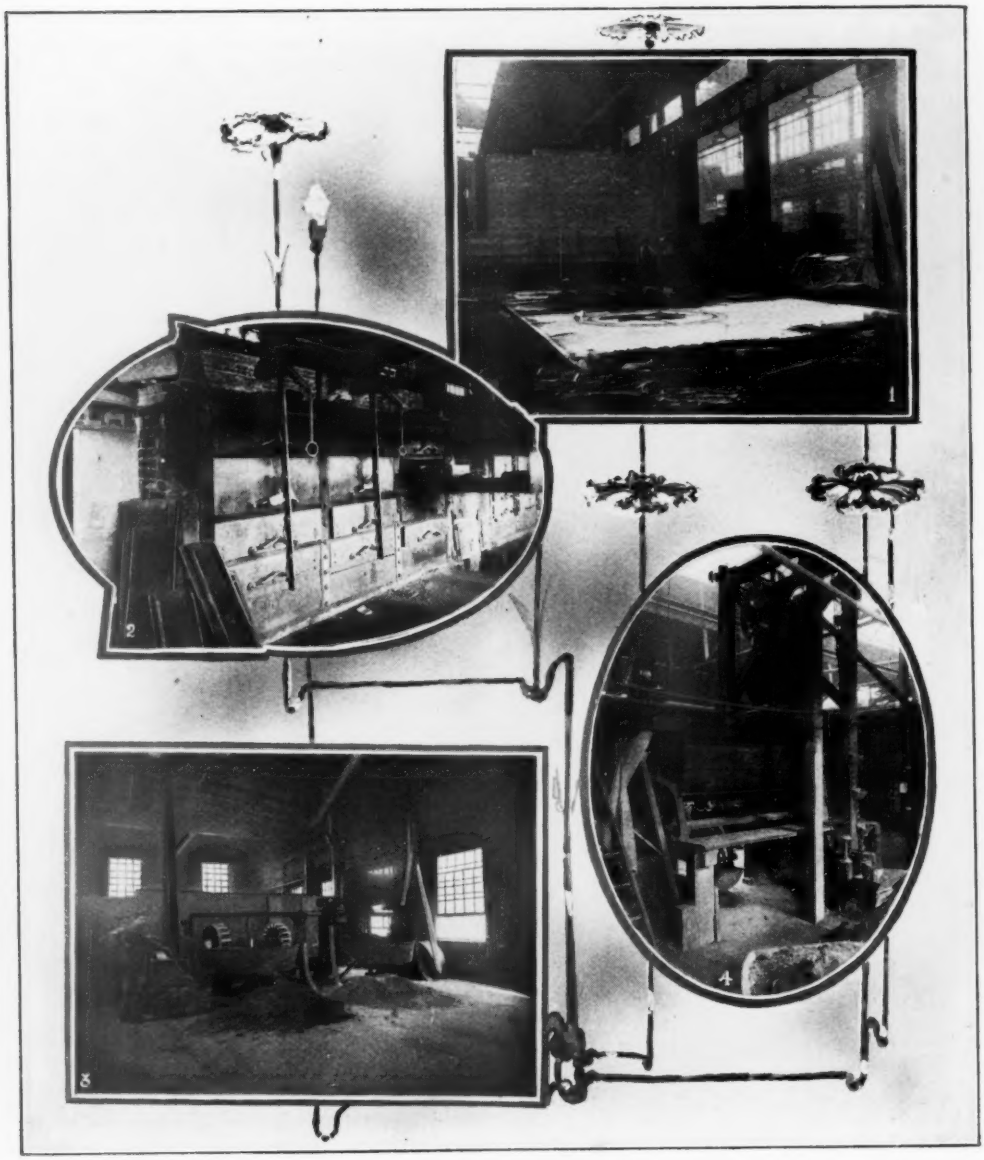


1 AND 2. DUMPING ARRANGEMENT FOR CHARGING SKIPS. 3. SCALE CAR ON NARROW GAUGE RAILROAD AND FIRE BOXES FOR CORE OVENS. 4. CUPOLA SPOUTS.

portion of the bay beyond the large core ovens and behind the core ovens is utilized for scratch house work. In order to avoid unnecessary handling some of the charging skip boxes from the cupola are brought across the foundry on cars and transferred to the cleaning floor by means of the traveling cranes. All scrap iron which is to be returned to the cupolas is charged into these skip boxes at once so that it can be taken in them to the cupolas without any rehandling. The sand cleaned

Each section of the plant is provided with a lavatory containing the necessary washing facilities, closets, etc., all arranged in the most approved manner.

The water supply for the plant is obtained from four artesian wells from which it is pumped into four large cisterns having a combined capacity of 400,000 gallons. Three Prescott fire pumps are arranged to deliver water into the main at a pressure of 125 pounds in case of a fire. Ordinarily one of the pumps



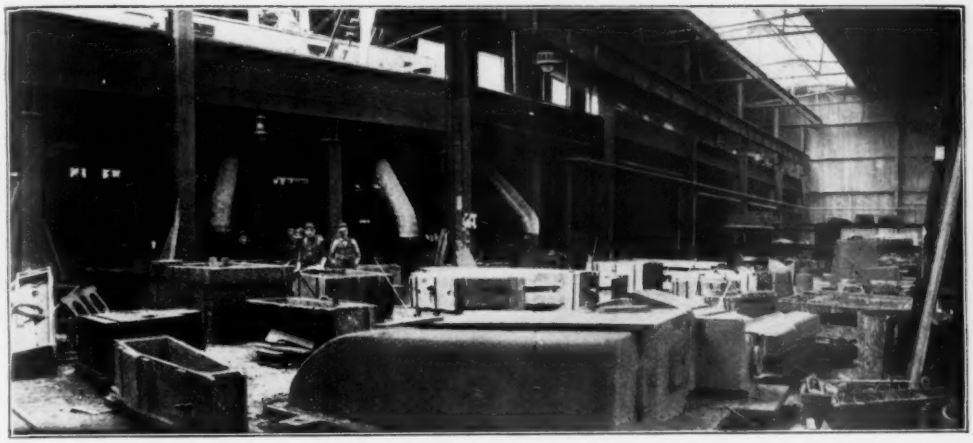
1. FLOOR FOR MAKING LOAM TOOLS. 2. COMPARTMENT CORE OVENS. 3. MUD MILLS. 4. SAND MILL.

is run at a time to supply the plant with water, the normal pressure being 60 pounds.

The entire plant is equipped with a double system of sewerage, one for taking care of the storm water and the other for the sewerage from the closet, etc. The latter sewerage is taken to a septic plant one-half mile from the shop situated on the company's property. Here the water goes through a system of purification after which the water from the storm water sewers is added to it and is allowed to flow to waste.

Lighting and Power System.

The entire plant is lighted by electricity, both arc and incandescent lights being used. All power is also supplied by means of motors either attached to the machines or by the use of countershafts. The wires for both lighting and power circuits are carried by a system of under-



CORE DEPARTMENT.

ground conduits lined with vitrified tile laid in cement.

Handling Facilities.

In addition to the handling facilities already mentioned, provision is made for bringing standard gauge cars into the foundry at three different points, tracks being extended across all three bays. These tracks also pass under the traveling cranes in the yard, which serve the storage space between the bays of the machine shop, thus enabling castings to be passed to the storage with the least amount of in-

GAGGER MOLDS

convenience. The cars can also be switched into the machine shops or erecting shop. Any scrap or condemned castings, too heavy to be taken from the scratch room floor on the charging skip boxes, as already mentioned, are loaded onto cars by the traveling cranes and switched around to the foundry yard where it is placed in the regular scrap department. The heavy scrap which is too large to be handled into the cupola is broken by means of a ball handled by the stock yard traveling crane. The company has its own locomotives for shifting cars about the plant.

MALLEABLE CAST IRON.*

BY RICHARD MOLDENKE.

Whatever may be the scientific definition of a malleable casting, for commercial purposes it is one made of iron of special composition and rendered malleable by subsequent annealing. The composition of the hard casting lies between well defined limits, and it is affected by so many conditions that the successful production of this class of work is one of the most difficult branches of the iron industry.

While nominally the composition of a good malleable casting is but little different than that of a car wheel or a roll, yet the fact that it can be twisted, bent and hammered out hot or cold and has double the tensile strength of these products shows that the constitutions of the castings are quite different. This difference in the constitution may be traced to the condition of the carbon in each. In the ordinary gray iron casting we may have some 3 to 3½ per cent graphite present. In the malleable casting we have the same amount, weighed as graphite in the analysis, but radically different in its characteristics. This form of carbon due to the annealing process has been called temper-carbon by Prof. Ledebur, who first described it in connection with the malleable (Ger. "temper") process. I will mention one of the peculiarities of this form of carbon. If a malleable casting which on fracture shows the fine black velvet surface, is heated up very high and then plunged into water all this amorphous carbon is dis-

*Paper read at the Milwaukee meeting of the American Foundrymen's Association.

solved, and the fracture shows the grain of a good tool steel. The same is often seen when a piece is hammered cold, and more especially when a casting that has become warped is heated up and straightened. The grain in the latter instances will not be as good as in the first one, but it shows that to straighten a malleable casting no heat, and preferable pressure only, should be applied. This characteristic of the carbon is often used to palm off malleable castings as steel ones, much to the disgust of the user and the producer of bona fide "malleable."

Of the properties of the malleable casting, it may be said in general that the tensile strength should run between 42,000 and 47,000 pounds per square inch. Castings showing only 35,000 pounds are still quite serviceable for ordinary work. It is not advisable to run much beyond 54,000 pounds per square inch, for the resilience is then reduced, and one of the most valuable properties of the malleable casting impaired. I have made much work running up to 63,000 pounds by the plentiful addition of steel to the mixture in the open hearth furnace. I do not, however, recommend this, as wherever such high results are wanted, they can best be obtained by using the steel casting direct.

As an instance of what can be done with malleable castings I will mention a series of tests made with bars of small and large diameters, which were heated and carefully drawn out under the hammer. While the interior, or high carbon portion was badly cracked up, the surface was of such a fine material that in one sample the tensile strength actually ran up to 123,000 pounds per square inch.

The elongation of a piece of good "malleable" will lie between 2½ and 5½ per cent measured between points two inches apart. The thicker the piece the smaller the elongation.

In making the transverse test, the deflection of an inch square piece, resting upon supports 12 inches apart, should be over ½ inch, the breaking weight being at least 3,500 pounds. Very soft iron often deflects 2½ inches under this test, but this is exceptional and may not be reproduced continuously.

The high resilience, or resistance to shock, in "malleable" is its most useful characteristic. It is well known in railroad circles that the ordinary steel casting comes nowhere near the malleable for service conditions. Only where an exceedingly high tensile strength is required, as in the car couplers for the heavy modern trains, is the malleable casting being gradually replaced. On the other hand, car castings, formerly made of gray iron, are now specified for malleable wherever possible, in the interest of greater strength and reduced weight. When we remember that the present production of malleable castings is at the rate of 650,000 tons per annum, and that at least half of this goes into car construction, the importance of the industry may be properly understood.

In spite of this enormous production, there is really little information available outside of the foundries most interested, and it may as well be said, also very little within. The founder is not going to increase the difficulties in his sales if he can help it, and the inspecting engineer, not being able to check the process from his own understanding, cannot act as intelligently as he really should. The American Society for Testing Materials is, however, at present at work on this very thing, and we shall soon have a set of specifications governing the production of these castings where good qualities are essential, which will insure better work all along the line.

Before going into the composition of good malleable iron it is necessary to look a little into its structure. Originally cast to be perfectly chilled, that is with the carbon all combined, and a contraction of about ¼ inch to the foot, the annealing process serves to expel the carbon from its state of combination, depositing it between the crystals of the iron, not in the crystalline graphite of the gray iron, but as an amorphous form not unlike lampblack. At the same time an expansion equal to half of the original contraction takes place, the net result being a shrinkage allowance for the pattern identical with that for gray iron castings of similar shape and thickness.

Beside this expulsion of the carbon from its combination, there is a removal of some of it from the outer portions of the casting. This amounts to nearly all in the skin to nothing ¼ inch inward. I do not take kindly to the generally accepted theory that oxygen from the packing penetrates the casting, removing the carbon by burning it out. I have always found that when oxygen has access to the interior, through the open structure of the iron itself, this is also oxidized with the carbon, and the whole presents a sorry sight. Whether, however, carbon diffuses out or not, in a good casting, I cannot say, and hope that this point

will some day be taken up and settled by careful experiment.

It will be noted that owing to the removal of varying amounts of carbon from the skin to the interior no carbon determination of a malleable casting is of any value, unless the sample is taken before the anneal, and even then it is only good for the total carbon. For an annealed piece a sample taken from the center of the fracture with at least ⅜ inch untouched around the drill would give a fair indication of the carbon contents, but cannot claim accuracy.

In former days of charcoal iron about 4 per cent carbon was the rule in malleable castings. In these days of coke irons and steel additions to reduce the carbon, this may run as low as 2.75 per cent before trouble ensues in the anneal, if not already in the foundry through excessive cracking and shrinkages. With the modern demand for a high tensile strength it is well to place the lowest limit at 2.75 per cent and the upper limit for common work would be found in the saturation point of this grade of iron, or 4.25 per cent. It is absolutely necessary that the hard casting be free from graphite; even a small amount of this indicates an open structure with consequent ruin to the work in the anneal from penetrating oxygen. To keep the carbon in the combined state is the function of the silicon percentage arranged for in the mixture, the rate of cooling due to the cross section, the pouring temperature, sand, etc.

The sulphur contents is quite important, especially just now when we are getting the sweeping of the coal mines for our fuel to a greater or less extent. The percentage should not be allowed to go over .05 percent, though double this may let a casting pass muster where good work is of no special object. Once the sulphur exceeds .05 per cent trouble may be expected. It is therefore wise to hold the pig irons below .04 per cent and to see that the fuel used is not too rich in sulphur.

Manganese is seldom troublesome, as it does not often exceed .40 per cent in the mixture, which means .10 to .20 per cent in the casting. Above .40 per cent in the casting it begins to give trouble in the anneal and therefore manganese as a general proposition should be kept low.

Phosphorus should not exceed .225 per cent and is better kept below this.

To get the proper silicon limit for the class of castings to be made is the trick which means either success or failure for a foundry. This will be realized from the fact that we do not know how the castings will come out until about a week after they went into the anneal. Now suppose the mixture is wrong, and the silicon is either too high which means "low" or rotten work, or too low in the castings, making them "high" (strangely contradictory, but nevertheless shop terms in daily use and dating back to the times when silicon was unheard of in malleable works), this means hard burnt white castings stronger than the first mentioned class, but equally undesirable. We do not know of this until a whole week's work, in all probability equally bad, has been placed in the ovens, and comes out in its turn only to wander into the scrap pile. Naturally disaster stares the inexperienced founder of malleable castings in the face all the time, and only a good laboratory will keep him out of hot water, everything else being equal. It also shows the necessity for better protection to the buyer, who cannot be supposed to distinguish between a good and only fair casting.

In general we may say that the thicker the casting the lower the silicon allowable in order to get a white iron in the sand. Thus for the heaviest classes of work, the silicon of the casting should not exceed 0.45 per cent. For ordinary work .65 per cent is the point to be sought for. Agricultural work may run up to .80 per cent, while the lightest casting may have 1.25 per cent without danger, though it is not advisable to exceed this limit for anything.

Our American practice differs from the European in several respects. We have a comparatively short anneal, that is we aim at a conversion of the carbon rather than its removal. Over there it is desired to get all carbon out, so that a wrought iron casting, if it may be so called, may result. With much of the iron cast from crucibles, it is quite possible to make very fine grades of work, and this may account for higher prices for malleable than steel castings paid in some parts of Europe. Imagine, however, what would result if we were compelled to employ the crucible process here, with an average production of 35 tons daily in the larger plants, or about 80 tons in the very large ones.

The common American practice is to use the reverberatory, or "air" furnace, either with or without the top blast over the bridge to hasten the melting. There is always a blast

introduced under the grates, unless indeed in our older works, the chimney draught is exceptionally good.

About 12 years ago the open hearth furnace was introduced into one of our largest works, and it was my good fortune to gain experience with it there. While not many malleable establishments have the open hearth furnace (I can count three on my fingers), yet it is undoubtedly the most economical melter there is, provided several things are observed. One is that it must be kept busy as much as possible, as only then its full economy is taken advantage of. Then skilled workmen must be kept in charge. This does not mean the steel melter, with his habit of letting the heat take care of itself, and tapping a ten-ton heat five hours after charging, whereas it should come out in two hours and a half, but it means a man who will use his muscle freely to rabble up the heat, push the pigs into the bath as quickly as they can be cared for, mix his iron well, fire sharp and quick, so that the process becomes one of melting only, rather than a refining or burning out of large quantities of silicon and carbon. When these conditions prevail, the open hearth will prove a friend indeed and turn out a most excellent product.

Let us take fair conditions with three heats daily from a 10-ton open hearth furnace. Using producer gas the fuel ratio is about one of coal to six of iron. In the reverberatory furnace the fuel ratio is one to four at best, and often only one to two. It is not advisable to make larger heats than 15 to 18 tons, as the time consumed in melting, and especially in pouring from the small ladles after tapping becomes so great that the bath is seriously damaged by undue oxidation and overheating. When the time comes for continuous melting in the malleable foundry, when heat after heat is taken off as fast as the bottom can be patched up and the furnace charged again, then will the complete economy of the open hearth furnace be fully realized. We may then also see the tilting furnace of value to us, though a device of my own, which I am using successfully in my own interests, and which allows the tapping from three spouts at different levels, successfully, has the advantages of the tilting furnace for malleable iron without incurring the heavy first and running costs.

For making malleable castings, the open hearth furnace should be pushed very hard for a time almost sufficient to collapse it, then it should be checked before actual damage is done to crown and ports. In this way a short, sharp heat is obtained, the silicon of the heat may be calculated for a loss of 20 to 25 points, whereas from 35 upwards is the rule in other processes. Three hundred heats should be taken off before repairs of several days' duration are required, and a total of at least 1,000 heats only should necessitate practically a rebuilding with but little loss other than the refractories.

In the meantime there has been much improvement in the air furnace. Strange to say, while the quantity of metal, the composition, excepting only in the phosphorus content, of the large roll and the malleable casting is the same, the air furnace used in each industry has been developed on different lines. In making rolls we find the short high reverberatory chamber, more on the lines of the copper furnaces, while in the malleable industry the furnace is long, very low, and contracted at the stack entrance. While formerly the hearth was practically rebuilt after each heat, at the present day several heats are taken off before a new bottom is made. The bungs, of course, always suffer, and herein the crown of an open hearth is much more easily cared for. But the poor efficiency of the fuel is an inherent difficulty which cannot be overcome, and presents new difficulties with every change of quality.

At the present time there is a general difficulty with the coal used, which means castings with an undue amount of sulphur. These castings are weak and will some day wander into the scrap pile. When the next slump comes we will be confronted with a serious condition. This high sulphur scrap will come into the market, in fact forced upon the founder wherever his castings can be identified. They will be hard to use by him, from the fact that high sulphur material will not be available for basic steel, as was the case formerly. There is then a neat problem, and one which will make the fortune of anyone who may discover an economical remedy, and that is the removal of sulphur from iron on a commercial scale. I present this to our experimenters and wish them success with it.

The cupola still turns out a considerable tonnage of malleable castings, but this process will be gradually superseded by the furnace method, chiefly on account of the better grade of work turned out by the latter. There is, however, one interesting point connected with

the cupola process, or rather with cupola iron, which we must go into more fully in connection with its bearing upon the anneal. Cupola iron requires some 200 degrees F. more than furnace iron to anneal it properly. This is a general proposition. It seems strange that it should be so, but possibly the structure of cupola iron is so close that it requires more effort to get the crystals apart and to effect the liberation of the carbon from its state of combination. Whether this is due to the contact of the metal with the fuel as it trickles down in thin streams and drops is hard to say, but the difference certainly exists and must be provided for in the anneal.

Naturally with a higher degree of heat the wastage of the annealing pots is more marked, and the process becomes more expensive in this regard also, for our annealing boxes must be reckoned as a dead loss which is to be diluted as it were by as long a life as possible in the ovens.

In studying the annealing process we find two extremes leading to about the same results so far as the carbon change is concerned. A short anneal at a very high heat is as effective as a comparatively long anneal at a much lower temperature. That is to say we can anneal, or rather change the carbon in a casting by placing it over night in a melting furnace which has been let cool below the melting point of the iron, or do the same thing in the annealing oven at a much lower temperature but giving it a week's time. Of the two methods the latter is by far the preferable, as it not only permits the change in the carbon, but also gives the carbon time to get out. Then again the chances of burning the castings in the anneal are obviated. The result is a good, reliable casting, while in the hurry-up process one never knows whether they are annealed at all. Sometimes they are and often they are not. Malleable founders, therefore, while experimenting for generations on short annealing lines, have come to recognize that the best all around and safe method is to arrange matters so that an oven may be regularly recharged on the same day of the succeeding week.

We may describe the annealing process by a curve which runs up quickly, remains horizontal for a short time, and then drops very gradually. That is, a sharp heating up, in the shortest safe time possible, then a shutting off of the dampers and maintaining of the temperature evenly for a period of say two full days at least, and then a gradual cooling down to at least a black heat before dumping. Here is where mistakes are often made, annealing pots being drawn red hot because some particular casting is wanted in a hurry. The castings are red hot when the air touches them, the delicate reaction of the carbon is disturbed and an inferior material results. I have always had softer, more malleable iron from the anneals which had the extra Sunday to become cold in the oven, and were cold when dumped on Monday morning.

An oven can be brought up to heat as quickly as may be, the fuel waste to do this being alone considered. In cities where the smoke problem exists, more time is required than in the open country. For a fair sized oven at least 36 hours are required to bring it up to heat (a pyrometer should always be used to test this), and then it should be held there.

As to the actual temperatures there is this much to say. Furnace iron of average thickness must have received over 1250 degrees F. after coming up, until cutting off the heat, to be safely annealed. Perhaps even then some of the work must be put back for another anneal. A safer limit is 1350 degrees F. and no more is necessary. This temperature must exist in the coldest part of the furnace, or usually at the lower part of the middle in the front row pots. As a rule the upper space of an oven is some 200 degrees F. higher than this, although I have succeeded in building ovens in which there was but a difference of 100 degrees F. throughout the whole interior space.

Translating these temperatures we find that 680 degrees C. is the lowest point for successful annealing of furnace iron, while 780 degrees C. is the safest one. For cupola iron the temperature should be about 850 degrees C.

If we contrast former times with the present, in the malleable industry, when charcoal irons only were supposed to chill, when immense piles were kept at the command of some melter who had inherited the art of looking wise over the test plug, where would we have been today when the importing of foreign irons is the order? In dollars and cents the benefit of science to the much neglected foundry industry has been incalculable, and perhaps the malleable foundry has received the greatest share, as it needed it most.

The J. I. Case Plow Works, Racine, Wis., increased their capital from $450,000 to $650,000.

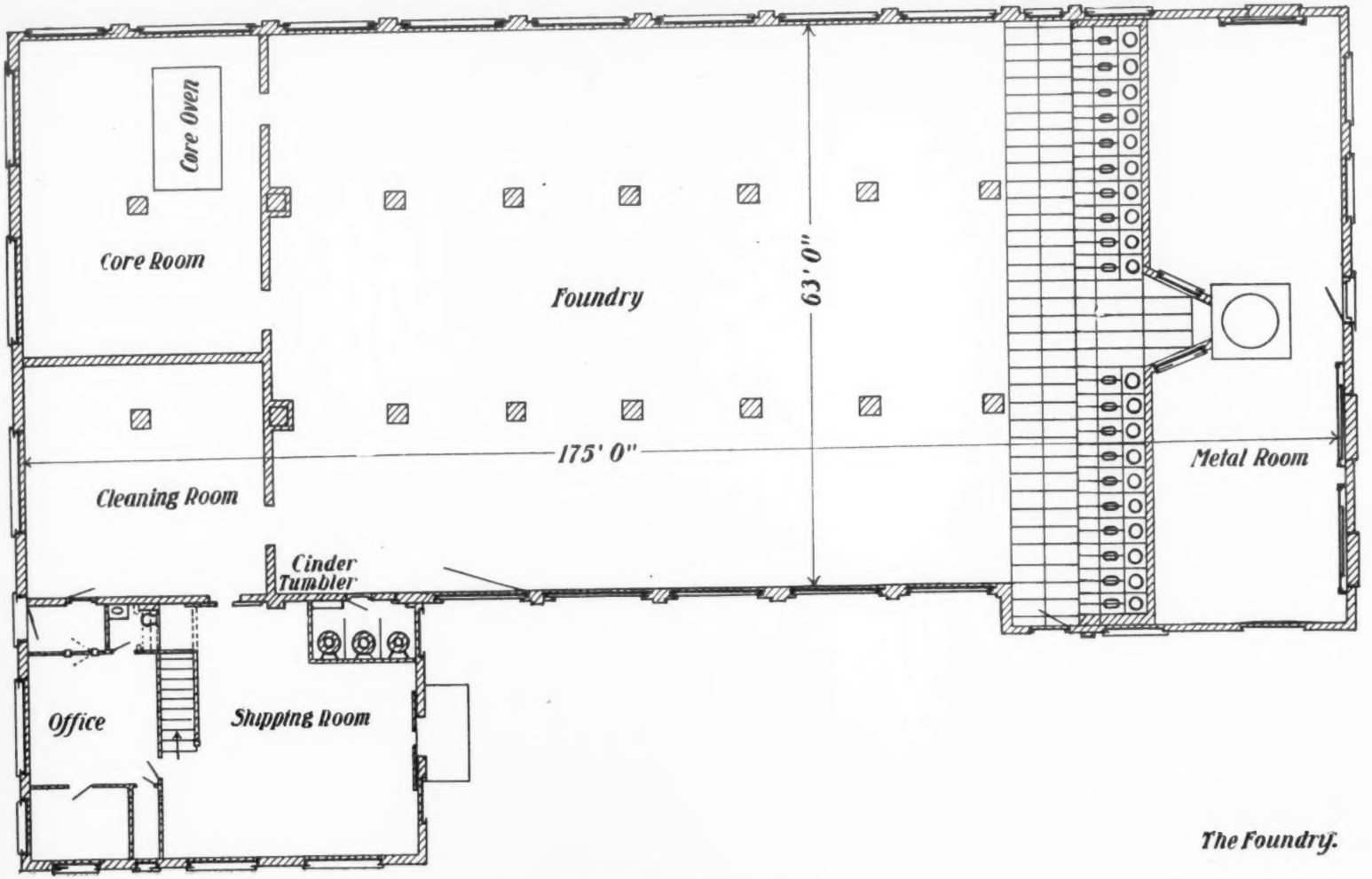


FIG. 1.—ALLYNE BRASS FOUNDRY.

The Allyne Brass Foundry Co., Cleveland, Ohio.

One of the most marked tendencies of the age is specialization. No foundry company would think of making its own shovels or many other special tools, and this same specialization is being carried further every day. The success of any modern specialty business depends upon finding something for which there is a general demand and then fitting up to manufacture the goods so that tney can be delivered to the consumer cheaper or better than he can make them. The day is fast approaching when the ordinary manufacturer will find it unprofitable to maintain his own brass or bronze foundry. Realizing these facts the Allyne Brass Foundry Co. has established a thoroughly equipped plant to do a general jobbing business in brass, bronze and aluminum castings. It manufactures no specialties of its own and makes no finished work. By specializing in this way it can secure enough of each class of work to enable it to deliver good, uniform castings at lower prices than most shops could make them. The melters, handling a large tonnage, as they do, become expert and can give just the desired metal for all requirements easier than the ordinary foundryman could.

The plant is located on Schiely court, near the Cleveland & Pittsburg tracks. The main building is 175 feet long by 63 feet wide with an office and shipping room at one side of the front. A general plan of the building is shown in Fig. 1, and view of the outside in Fig. 2. At the rear of the building is the metal store room. The stack for the furnaces passes through the middle of this room. The stack is 85 feet high and 36 inches inside diameter. This furnishes ample natural draft for the twenty crucible furnaces. The furnaces are arranged in two groups of ten each at the back of the foundry and just forward the metal room. The general arrangement of the furnaces is shown in Fig. 3. One of the doors of the metal room can be seen near the center of the view. When not in use the crucibles are kept on iron rack shelves over the furnaces, thus insuring dry crucibles. Mr. Allyne has devised a very handy device for removing the pots from the furnaces. It consists of an I-beam supporting trolleys from which are suspended levers provided with three handles at one end and a quadrant at the other. The quadrant is made from angle iron and carries a chain with a hook at one end which can be secured to the lifting tongs. By this device the pots can be lifted and carried to the center of the room where they are skimmed and placed in shanks to be carried to the molding

FIG. 2.—GENERAL VIEW OF FOUNDRY.

FIG. 1.—ALLYNE BRASS FOUNDRY.

floor. This lifting device was selected after carefully considering the pneumatic lift proposition. The objection to the pneumatic lift was that at times it was more or less jerky and the heat and gases would cause continual trouble with the air hose. The trolley and lifting arrangement is very plainly shown in the cut. The cut also shows the balanced furnace covers and the grating over the furnace pit. The furnaces, a section of which together with the furnace pit, is shown in Fig.

The molding floor is divided into three bays by two lines of posts. It is intended to place a traveling crane in the central bay in the near future.

When running full handed they employ 100 men and can cast about 3,000 pounds of aluminum and 6,000 pounds of brass and bronze per day. They can make brass or bronze castings weighing up to 4,000 pounds each. They purchase their supply of metals in carload lots.

FIG. 3—MELTING FURNACES.

4, were designed by Mr. Allyne. They are so arranged that all of the grates can be dropped from the top of the grating in front of the furnace by means of chains attached to the grates, as shown in Fig. 4. The ashes and coke that drop into the pit are then quenched by a sprinkling system and removed from the pit the next morning. At one end of the pit there is an incline leading to the yard so that workmen can wheel out the ashes.

The core department is equipped with a full set of benches, racks, two millet and one truck oven. Much of the work, and especially the aluminum work, containing very intricate cores.

The cleaning room is equipped with a metal band saw, sprue cutter, emery wheels and magnetic separator. They also have a wet mill for cleaning the skimmings, sweepings, etc. As they are strictly a job foundry, making no

specialties, they do not require any extensive mechanical equipment. The small amount of machinery required is driven by an electric motor, the current being obtained from an outside company.

They are just installing two plain squeezer molding machines to make some of their duplicate work.

When handling a great variety of work as they do it is generally necessary to use from eight to ten mixtures each day, so if a rush order comes in they are almost sure to have the required metal in the furnace.

allel with the foundry on one side are a series of sheds extending the entire length of the building. In these sheds about six months' supply of coke and sand is kept and the extra flasks stored. The plant and equipment cost about $75,000.

SOME CUPOLA PRACTICE.

BY R. H. PALMER.

Some time ago there appeared in *The Foundry* several articles on the melting ratio. Like others interested, I read them at the

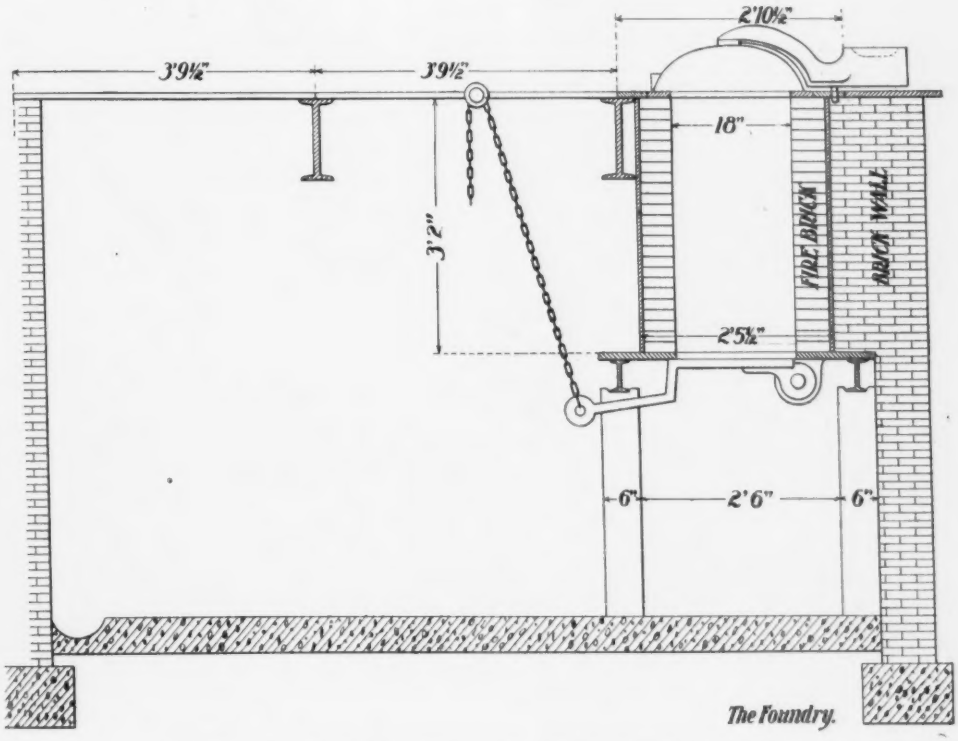


FIG. 4.—SECTION OF MELTING FURNACE. FLUE AT REAR NOT SHOWN.

Some idea of the aluminum and other castings made can be had from Fig. 6, which shows a general view of the stock room. The shipping platform at the rear is about 30 inches high, with a step or shelf half that height to assist in lifting heavy castings. These dimensions will give some idea of the size of the aluminum castings piled upon the shipping platform.

They have two acres of ground which give space to enlarge the capacity of the plant as their business grows. At the rear of the property are the stables and wagon sheds. Par-

time with pleasure. Thinking the matter over, I have visited a number of foundries in a New England state and obtained from them statements of the way they were charging their cupolas at the time. I am confident that the facts as ascertained are in accordance with their practice at the time, as the parties readily answered all questions. The management of a cupola is at all times a topic of interest to foundrymen, as upon what he gets from it largely depends his success. Very often we read of some one who is doing extra well in obtaining a high melting ratio, but it

FIG. 5.—NO. 1. GENERAL VIEW OF FOUNDRY. 2. HEAVY WORK FLOOR. 3. CORE DEPARTMENT. 4. CLEANING ROOM.

is seldom stated how this high ratio is obtained. In other words, sufficient data are not given to enable one to compare the results with his own. A man having light machinery castings to pour, using all pig iron, and his returns with the same kind of a cupola used by another man for making rougher and heavier castings, using largely stove plate or other thin scrap, will find his ratio well below that of the second man. This would be true even though the two cupolas are melting the same amount of iron. The first man must have his iron hot to run his light castings, as his castings call for sharp outlines. The second man does not have to be so particular with his rough work on account of the fact that if some of the corners are rounded the castings will still pass. In the first case much of the work has to be finished by machining, so that dirt or blow holes would render such castings unfit for use. In the second case, dirt or blow holes would not show and generally would not damage the castings. In the first case the castings must be machined and hence soft, while in the second case no machining, unless it is a little drilling, will be required, and hence much harder castings would pass.

The man producing the heavier castings has the advantage in some ways, as he is apt to run nearer the capacity of his cupola than the average man making light castings. On the other hand, the first man can get along with a cupola having a shallow basin, as the distance from the bottom to the tuyeres is termed, on account of the fact that the iron is taken away about as fast as it melts, while the man with the heavy work is obliged to have a cupola with a deeper basin on account of the time required to take away and replace larger and heavier ladles. As the depth of the basin increases the amount of fuel in the bed charge has to be increased.

Formerly scarcely two foundrymen had the same kind of a cupola. The arrangement of the tuyeres was a point on which opinions

FIG. 6.—SHIPPING ROOM OF THE ALLYNE BRASS FOUNDRY.

FIG. 5.—NO. 1. GENERAL VIEW OF FOUNDRY. 2. HEAVY WORK FLOOR. 3. CORE DEPARTMENT. 4. CLEANING ROOM.

varied greatly and each foundryman was sure he was right. With the event of the foundry equipment companies, who make a specialty of these matters, the number of styles of cupolas has been materially reduced.

One of the discouragements the average foundry foreman meets with is when some one publishes an account of an extremely high melting ratio which they have obtained. The manufacturer sees this and calls Mr. Foreman into his office. The article is shown him and he is asked to do better. The foreman probably knows that he is doing all that he possibly can under existing conditions and that the writer of the article shown him is working under more favorable conditions. He also knows that there are such things as fancy heats made under especially favorable conditions, but that these are not the every day experience of the foundry. He tries to call the manager's attention to these points, but the high melting ratio is still held before him as a most important point.

Some time ago the writer had a conversation with a foreman of a foundry producing some of the best light castings in that city. He stated that he was making 19 tons of iron per day at a ratio of 8 to 1, and that a man near there was making a ratio of 10 to 1. He wanted to know why he could not equal this ratio as he had just as good a cupola as the other man. The question was answered by asking what variety of castings the other man was making and pointed out the fact that the conditions in the two foundries were different.

The following are the results obtained from eight foundries where inquiries were made:

1st. Cupola used was a Colliau, 42 inches in diameter inside of the lining; fuel, all coke; bed charge, 1,300 pounds of coke, 4,000 pounds of iron; second charge; 300 pounds of coke, 2,000 pounds of iron; the succeeding charges were made up of 225 pounds of coke and 2,000 pounds of iron, with the exception of the last two, which were 210 pounds of coke to 2,000 pounds of iron, and 100 pounds of coke to 2,000 pounds of iron. The total run varied from 17 to 18 tons. Where 4,835 pounds of coke were used, 38,000 pounds of iron were melted, giving a ratio of 7.86 iron to 1 coke.

2nd. This foundry was owned by a practical man of long experience in all departments. He was producing some of the best heavy castings for engine and heavy jobbing work. The cupola had a straight shell, 42 inches inside the lining and fitted with a wind box on the outside. The bed charge was composed of 800 pounds of coal and 450 pounds of coke, upon which 5,000 pounds of iron was placed. This was followed by eight charges of 300 pounds of coke and 2,000 pounds of iron. The succeeding charges were 275 pounds of coke and 2,000 pounds of iron. Total amount of fuel used, 5,437 pounds; total amount of iron melted, 34,000 pounds, giving a ratio of 6.26 to 1.

3rd. This foundry carried on a general jobbing business, turning out good work, some of which was quite intricate. The castings varied from 35 pounds to 4,000 pounds. The cupola was a Colliau, 39 inches inside lining. Bed charge contained 900 pounds of coke, 3,000 pounds of iron. This was followed by three charges of 250 pounds of coke and 3,000 pounds of iron; one charge of 200 pounds of coke and 3,000 pounds of iron, and one charge of 100 pounds of coke and 2,000 pounds of iron. Total amount of coke used, 1,950 pounds; total amount of iron melted, 17,000 pounds. Ratio, 8.72 to 1.

4th. This foundry does fairly heavy work up to castings of 19 tons each. Cupola, No. 3 McKenzie, altered over by placing wind box on the outside. The cupola was elliptical, 38 by 45 inches inside. Bed charge was composed of 900 pounds of coal and 3,000 pounds of iron. The nine succeeding charges of 275 pounds coke to 3,000 pounds of iron. The total amount of fuel used was 3,375 pounds, and of iron melted, 30,000 pounds, giving a ratio of 8.89 to 1.

5th. This foundry was producing castings for cotton machinery. The cupola was a No. 3 McKenzie. They were melting 10,868 pounds of iron, using coal as a fuel, and the ratio was 6.2 to 1. Several years before the former foreman of this same foundry had given me the following as the practice which they were then following, and as I have no reason to think that the cupola has been changed, it shows what can be done with it. Bed charge, coal, 900 pounds, iron, 4,500 pounds; succeeding charges, coal 400 pounds, iron 4,000 pounds; total amount of fuel used, 1,700 pounds, and of iron melted, 12,500 pounds; ratio, 7.35 to 1. At the time the last information was given me they were not melting quite as large an amount of iron as shown in the second statement. They claim that their ratio was about 7 to 1.

6th. General jobbing foundry, making a light class of work and using a great many

small cores. The iron had to be very hot in order to pour some of the work, which covered a great variety and was a very high grade. The cupola was of the straight type, 45 inches inside of the lining. The bed charge was composed of 800 pounds of coal and 800 pounds of coke, upon which 4,000 pounds of iron was placed. The succeeding charges were composed of 230 pounds of coke to 2,000 pounds of iron; 5,280 pounds of fuel were used to melting 36,000 pounds of iron, giving a ratio of 6.82 to 1.

7th. This is a general jobbing foundry, doing considerable bench work. The work was rather light and thin, but of a good grade. Straight cupola, 40 inches inside the lining. The bed charge consisted of 800 pounds of coke and 2,500 pounds of iron; the next charge, 200 pounds of coke and 2,500 pounds of iron, and the third and the last charge, 150 pounds of coke to 2,500 pounds of iron. Total amount of coke used, 1,150 pounds; total amount of iron melted, 7,500 pounds. Ratio, 6.55 to 1.

8th. This foundry produced castings for cotton machinery, cupola Colliau, which was intended to be lined with 30 inches inside diameter, but was lined with 28 inches inside diameter. Bed charge was composed of 400 pounds of coal, 160 pounds of coke and 2,300 pounds of iron. The next charge, 160 pounds of coke and 1,500 pounds of iron. Succeeding charges, 120 pounds of coke and 1,500 pounds of iron; last charge, 80 pounds of coke, 700 pounds of iron. Total amount of fuel, 1,640 pounds; total amount of iron melted 15,000 pounds, giving a ratio of 9.15 to 1.

I have not given the names of the foundries, as some did not care to have their names appear, though many of them were perfectly willing to do so, but I have treated all alike.

It will be seen that in the eight cupolas mentioned there are two styles of McKenzie cupolas in regard to tuyeres, thus giving five styles in all.

I do not write the foregoing with a wish to draw out comparison. It is with a view to try to show what was actually being done in these foundries at the time.

The M. A. Cook Boiler Co. will move its plant from Nashville, Tenn., to Peoria, Ill., and will occupy the old O'Brien foundry building. It will be thoroughly overhauled and used until a new building is erected at some future date.

CASTING RING PULLEYS.

BY HARRY WILLIS, CHRISTCHURCH, NEW ZEALAND.

There are many methods of making pulleys, some of which are pursued because the pulleys were made that way in the past, and if it was good enough then it must be good enough now. Some foremen molders, unfortunately, are victims of circumstances and have to continue in the same old groove whether they like it or not, as their employers are adverse to giving them an opportunity for trying new methods. Any extra outlay in the molding shop for the purpose of increasing the product in any particular line is discouraged by such parties unless a direct return is apparent. I do not wish to infer that this state of affairs exists in all molding shops, but it most certainly does to a great extent in many general jobbing shops unless the owner happens to be a practical molder himself, or has taken an intelligent interest in the progress of the molding shop. "There is nothing new under the sun," we are told, which, I believe, is, to a great extent true, therefore I should not be surprised to find other shops working on similar lines to those which we have adopted.

In molding a pulley we use a plain rim about 12 inches deep and varying in thickness according to the diameter of the pulley. This is bedded into the floor and the sand inside struck out, by means of a strickel, to form a bed upon which to set the arm cores. The arms are made in cores formed in a special core box.

There are two great advantages in molding pulleys in this manner. First they can be molded with any depth or width of face that may be required; second no cope part or gaggers are required; third the pulley is cast with rim uncovered. The process is as follows: the rim is bedded in the floor to the required depth, leveled up and sand rammed on the outside of it and on the inside to a depth sufficient to form a bed for the arm cores. The sand is then struck off to form a bed of the proper height. The arm cores are placed in position and weighted down. The hub is formed by the inner ends of the arm cores, the central core is placed in position and the top of the boss or hub covered with a loam cake core through which holes are arranged for the gate pins. The gate pins are then fastened in position and the inside of the mold rammed up, the rim being drawn up to form the required width of face. The rim is usually drawn two

inches higher than the finished pulley to allow for an overflow and also to allow plenty of metal to be turned off in the lathe so as to insure a clean edge to the pulley. When the pulley is rammed up and the pattern drawn, two steps half an inch deep are cut on each side of the pulley and a trench dug to take the overflow metal. The gate or head box is placed in position, a plate of iron being used to support it over the rim so as to allow the box to extend out beyond the rim of the pulley for convenience in casting. After the pulley is cast, we usually pour a little water around the top edge of the rim to set the top of the rim quickly, the casting being fed through the hub or boss with hot metal introduced for this purpose.

In addition to the fact that no copes or gaggers are required in the above process, the saving in storage room for patterns is considerable as the pattern rims may be stored one inside the other and the core boxes arranged upon a shelf close by. The great saving in labor in making pulleys by this method will be apparent to all jobbing molders. I have seen two 4-foot pulleys with 14-inch face molded and cast in seven and one-half hours by one man. This would have been an utterly impossible task if the work had been done in the ordinary manner with a pattern having a 10-inch or 12-inch face.

A branch of the American Locomotive Works, located at Manchester, N. H., is to be moved to Schenectady, N. Y.

CASTING BRASS LINERS ON TAIL SHAFTS.

BY JOHN F. BUCHANAN, SYDNEY, N. S. W.

Brass founders doing marine engine casting have to handle a variety of heavy and complicated jobs. In previous articles I have referred to such undertakings as burning new tips on to broken propeller blades and casting liners on tail shafts. In the latter instance I described an experiment which I made to overcome the tendency to porousness by casting the liner on in two separate thicknesses,

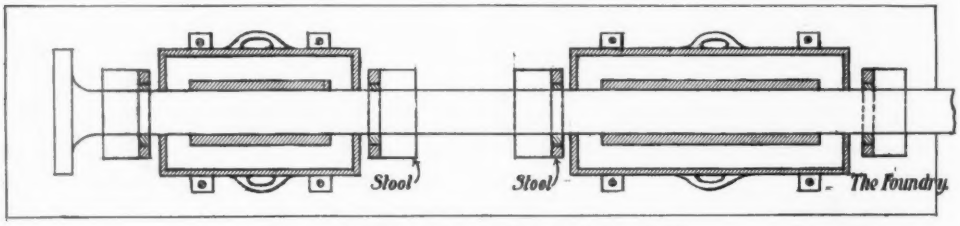


FIG. 1.—CASTING BRASS LINERS ON TAIL SHAFTS.

but as I pointed out the double expense of labor would hardly make this a popular method. It has since occurred to me that the description of another method adopted by a large shipbuilding firm on the Clyde would be of interest. The tail shaft is a very important part of the equipment of a steamship, and this method of covering the parts on journals with brass has been approved by the British Admiralty. All the power of the engines is conveyed to the propeller wheel along this shaft, without

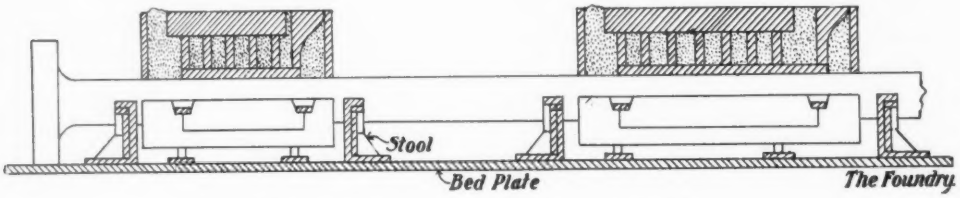


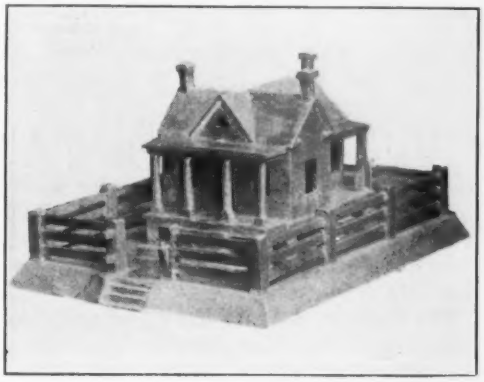
FIG. 2.—CASTING BRASS LINERS ON TAIL SHAFTS.

which the best built vessel is a spineless hulk. The rules applying to the dimensions and materials for shafts and liners are very carefully observed by shipping companies and inspecting engineers. They recognize the great risks involved in even slight deviations from known factors of safety. Quite recently Lloyd's have recommended that tail shafts be covered with brass the entire length between the journals, but the common practice is to cover them only where the bearings occur as shown in Fig. 1. Casting brass on to iron or steel is

always a difficult matter to accomplish satisfactorily. The expansion of the metals is different, causing cracks; the affinity of the metals is weak, the iron repelling the brass and creating sponginess; besides it is well known that iron when it is heated, emits a gas, which in the case of shaft liners accumulates inside the mold when it is closed and is absorbed by the molten brass when it is poured, producing troublesome blow holes. The remedies for these evils are first: not to overheat the iron—a very dull red scarcely perceptible in the shade being all that is required; second, to provide sufficient risers for carrying off the gases and feeding the casting. Pump rods, feed screws, eccentrics and other small gear, are usually lined in vertically cast molds, but with tail shafts running 12 feet and upwards in length and weighing several tons, this method is impossible. Horizontal pouring may be quite as successful if the precautions already indicated are taken. From Fig. 2 it will be seen that a bed plate is leveled to receive the shaft which is supported by iron stools having V-shaped notches on the top. Strips of wood the required thickness of the liners are then tied around the circumference to form the patterns and the molds are rammed up with the shafts in position, the parting being formed at the center. The copes are then removed and the shaft lifted out and placed on supports ready for heating. Great care is necessary in this part of the work as the shaft is liable to warp if it is not properly blocked up. Some prefer to bed the underside of the shaft from end to end, in sand, before applying fires to the parts to be covered, but most molders will agree that iron to iron is a more workmanlike method of staying anything. Beyond mentioning the fact that a closegrained gun metal something like steam metal should be used and a surplus flowed through the risers to give good results, I need say no more. An alternative method of doing this job is to cast the liners separate from the shaft and shrink them on, preferably in one length, but sometimes they are shrunk on in sections with lap joints. The shrinking on of liners, however, requires considerable skill, and a slight error of judgment in boring or in expanding the liner may result in failure. It is no uncommon thing for the liner to stick, burst or be hollow in places, when it is fixed in position on the shaft. These risks coupled with the extra expense incurred in boring the inside of the liners and shrinking them on accounts for the method of casting them direct on to the shaft being more favored by engineers.

A NOVEL CASTING.

Mr. Dan Galvin, of Paducah, Ky., has made a rather remarkable casting which is shown in the accompanying illustration. He calls it his Kentucky farm house. Some idea of the size of the casting can be gained from the following general dimensions: The base is 8½ x 6½ inches, the fence is 8 x 6 inches by 1 inch in height. The height of the house is 3¼ inches, the length 3¼ inches and the width 3½ inches. There are eight pillars, three doors, six windows, three rooms and three chimneys. The thickness of the metal of the house is ⅛ inch.



A NOVEL CASTING.

The weight of the entire casting is 6 pounds. The casting is made of brass, the patterns and cores were made at home in leisure moments and put together and cast on a holiday. He has presented the casting to the Paducah Machinists' Union, who will have it polished and put on exhibition.

SOME NEW BUILDING MATERIALS.

The question of light is always of vital importance in a foundry. Skylights have never been successful on account of their great liability to leak and trouble, which was caused frequently by water entering the molds from this source.

Henry Maurer & Son, of New York, have recently brought out transparent glass tiles, which are made of the same shape and form as the red clay roofing tiles and can be used interchangeably with them. Their plan is to substitute these glass tiles for a portion of the clay tiles, thus forming a continuous roof,

some portions of which are transparent. They have been using these tiles on their own buildings for some time, and the Barber Asphalt Paving Co., at Maurer, N. J., has adopted them. The tiles can be attached either to wooden rafters or angle irons. Usually their own weight is sufficient to keep them in place, but they can be fastened to the rafters or angle irons with copper wire.

This company also manufactures the Phœnix hollow blocks, which are made of hard burned terra-cotta. The usual size is 4 x 8 x 12 inches, though any size can be made. These blocks make very light but strong walls for partitions or for general building purposes.

FOUNDRY FLOOR PITS IN WET SOILS.

Where work of some length has to be cast on end, it is, of course, necessary either to have pits sunk in the earth or the casting floor at a sufficient height, the latter being in most cases an inconvenient arrangement. If the soil is one which is naturally wet, the cost of making pits is considerable, and unless the water is excluded the cost is thrown away. With care, however, water can be excluded, but close supervision of the work is necessary to ensure that this is the case.

The shape of the pits will vary, partly to meet personal ideas, and partly to utilize space; but for strength, circular pits are best, particularly when the pressure of the soil is equal on all sides. The depth will be such as the general run of work necessitates, and on this the thickness of the floor will somewhat depend, as usually the greatest resistance is required at the bottom; but in addition to depth the area must be considered, as a large area is more likely to lift than is a small one.

Probably well-puddled, adhesive clay will resist water as well as anything, and 1 foot in thickness of well-tempered clay, put together so as to be free from cracks and fissures, should be ample. Overlying this, from 1 foot to 18 inches of good cement concrete should be placed. The walls should be built on the concrete, and, in accordance with the size of the pit, be from 9 to 14 inches in thickness, good sound bricks set in cement and sand, and well grouted together, being used. The work being permanent, sound and good work of a lasting character should be adopted, and there should be no open joints. The top row of bricks should be bullnosed, on the inner edge at least. In placing the concrete for the floor, it should be so arranged that the backs of the walls from and continuous with the bottom layer of clay puddle be backed with 1 foot of puddle well put together, and when this is done water will be excluded. Where, owing to the water pressure, it is not an easy matter to build a pit, and yet where it is necessary to cast on end, the question will arise as to whether it is worth while to have a raised casting floor for such things. In laying out foundries in wet situations it would be always worth while to consider whether it would not be better to have the molding floor on a raised position rather than on the ground level, as in such case provision could be made for all kinds of castings. The cost of a foundry so arranged would be more, no doubt, but any space not utilized for the actual casting work below the floor level could be used for other purposes—coke store, for instance,—and probably the cost of the foundry generally could be reduced in this way.—Walter J. May in Mechanical World.

A HOME-MADE MOLDING MACHINE.

The W. A. Jones Foundry & Machine Co., of Chicago, Ill., has recently made some molding machines for its hangers which are very effective and at the same time extremely

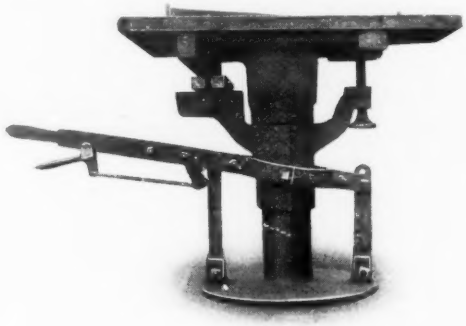


FIG. 1.

simple. The accompanying halftones show two views of the machine. It consists simply of a heavy base and column cast in one piece. The column supports a stationary stripping plate, which in this case is made of wood. Iron plates are let into the stripping plate to receive the dowel pins of the flask. The flasks are made of such a form that they will take the minimum amount of sand for casting hangers and are all interchangeable. The pattern itself is supported by three screws which extend

down to a yoke below the stripping plate. The lower portion of this yoke surrounds the column and it is controlled by a lever as shown. The screws permit adjustment of

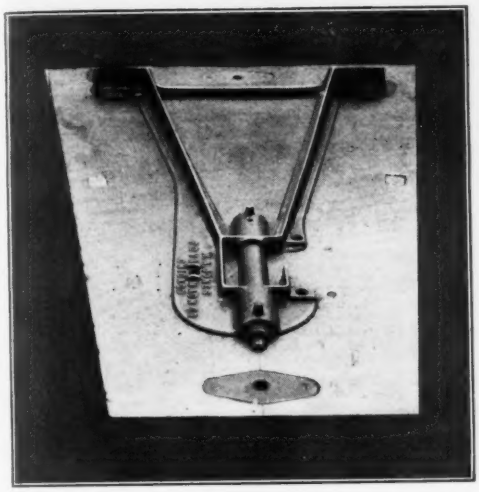


FIG. 2.

the pattern in the stripping plate. The machine is light enough to be portable and has proven very efficient.

New Form of the Journal of the American Foundrymen's Association.

In accordance with the action of the association at its convention at Milwaukee the *Journal of the American Foundrymen's Association* is to be published as a quarterly, the first number of which appeared in October. It is certainly a very creditable publication, and one of which not only the members of the association should be proud, but one in which all foundrymen should take an active interest. The editorial work has been divided as follows: Managing editor, Dr. Richard Moldenke, secretary of the association; associate editors, Thos. D. West, S. H. Stupakoff, Wm. H. Perry, Herbert Field, Jos. A. Murphy and Kenneth Falconer. In addition to the regular tranactions of the association, the different associate editors are to have charge of departments dealing with subjects of special interest to foundrymen. This should certainly make the *Journal* of interest to all foundrymen.

The new foundry of the Union Steam Pump Co., Battle Creek, Mich., is expected to be ready for work about Dec. 1.

NON-CORROSIVE ALLOYS.

BY ALONZO RAMSDELL.

This is an age of invention and discovery, and the metal to be described has resulted from a long series of experiments. The use of iron and steel in the building trades has increased enormously in the past two decades. The question of an alloy which will be strong as iron and steel and practically non-corrosive is one of very great importance. As a result of my experiments I have succeeded in producing an alloy which is only slightly corrosive after long immersion in the ocean, and have secured letters of patent on the same. The most important use to which this metal can be put will be in the manufacture of agricultural implements of all kinds, especially plows; also for the manufacture of pipe for water, gas or acids, and for sub-marine work. It will be of great value for exposed structural work. As to the value of this new metal in sub-marine work, some experiments have been made by the Sub-Marine Signal Co., of Boston, and the results of these tests were reported by them in the following letter:

"BOSTON, MASS., March 12, 1903.

"Dear Sir: In answer to your letter of Feb. 22, I send you to-day the samples of iron which you sent me about Jan. 15. They have been in sea water about six weeks and as you will see are somewhat corroded; however, not nearly so bad as ordinary iron would be with the same exposure. If you could make the metal to stand salt water better than this it might be quite useful to us and it would have a wide application. As it is, it is not quite good enough for our purpose. You will notice that one of the samples is more corroded than the other. This is due to the fact that it had a strip of brass attached to it while in salt water, which induced a galvanic action. I tried the same sample that way because for most of our purposes it will have to be used in connection with brass or composition metal. If you can make a metal to stand under such conditions without corrosion, I will be glad to try another sample.

(Signed) SUB-MARINE SIGNAL CO.,
"Boston, Mass."

The patents cover a metal composed approximately as follows: Cast iron, 100 pounds; lead, from 9 to 10 ounces; antimony, 2 to 8 ounces; aluminum, 4 to 10 ounces. The cast iron is to be melted and the other metals mixed and stirred into it while it is in a molten condition.

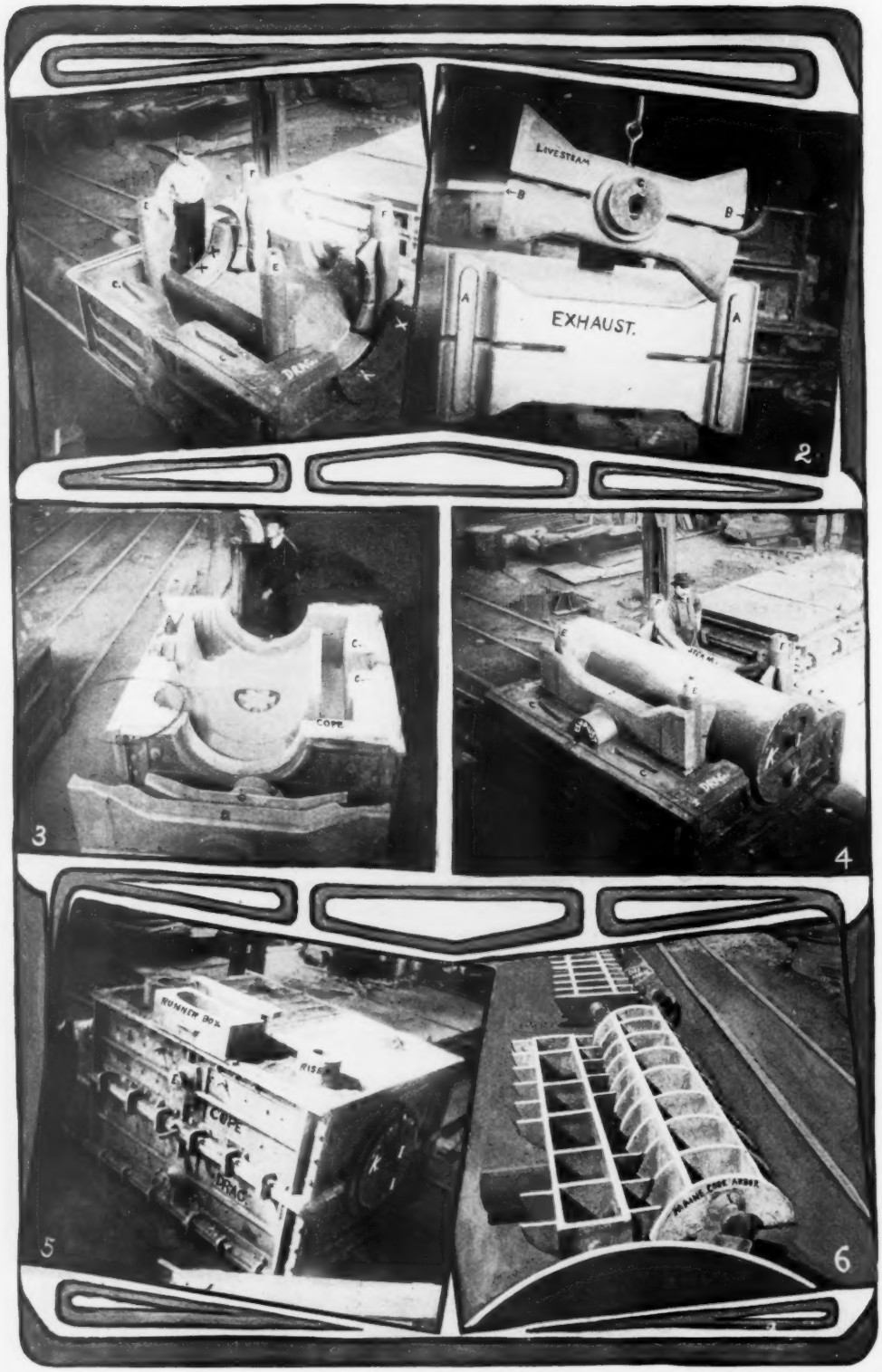


FIG. I.—DETAILS OF CYLINDER MOLD.

CORLISS CYLINDERS IN DRY SAND.

BY PAUL R. RAMP.

For the benefit of those interested in dry sand molding the writer has endeavored to describe a method of making Corliss cylinders. In this instance a pattern is used and is rammed up in the usual manner. The pattern is then drawn from the mold, the mold finished with a solution of black lead and molasses water and placed in the oven to dry. Fig. 1, No. 1, shows the drag portion of the mold of the Corliss cylinder after it has been taken out of the oven. The valve cores on the steam and exhaust sides have been placed in the mold. Letters E E represent the valve cores on the exhaust and F F on the live steam side. X X are the prints that support the main bore core. This main core is made of the same material used in the other cores and in the same manner, i. e., in a core box, which I consider superior to a core barrel where very large castings are being made. Letters C C designate the gates that lead from the down-gates in the cope into the bottom of the mold on the exhaust side. The idea of gating this mold on the exhaust side is to avoid the danger of a leak in the casting, such as might result if the gates were placed on the steam or high pressure side and some slag or dirt be allowed to flow into the mold through the gatings. The live steam connects with the valve cores at B B and the inlet for the live steam is formed at C. Letters A A show where the exhaust core connects with the valve core. No. 2 shows the mold ready for the cope, all of the cores being in their respective positions. The main bore core is shown at K.

I wish to call the reader's attention to the trunnions shown at I—that project through the end of this core. The trunnions make it safe and easy to handle the core while joining the two halves and placing them in the mold. No. 4 shows the cope portion of the mold. The down-gates are shown at C C. A portion of flour is distributed over the joint of the drag and on the core prints that come in contact with the cope and the cope closed and drawn down tight with clamps. The clamps are then loosened again, the cope hoisted off and the dirt blown out of the mold. The mold is then carefully inspected to see if there is a crush anywhere as the result of an irregular or poorly made parting. When this has been accomplished, a thin roll of putty or clay is laid on the drag joint and over the prints of the cores to prevent a run-out, or the iron getting into the vents. The cope is then lowered on to the drag and securely clamped. No. 5 shows the mold closed and clamped ready for pouring. It will be noticed that the main core K projects through the ends of the flask. This is done to enable the molder to properly secure and to stop-in around it.

The runner box is rammed up at the same time the mold is being rammed and dried with the mold. This is much better than using a green sand runner as there is no danger of the runner cutting when made in dry sand.

It will be interesting to note the construction

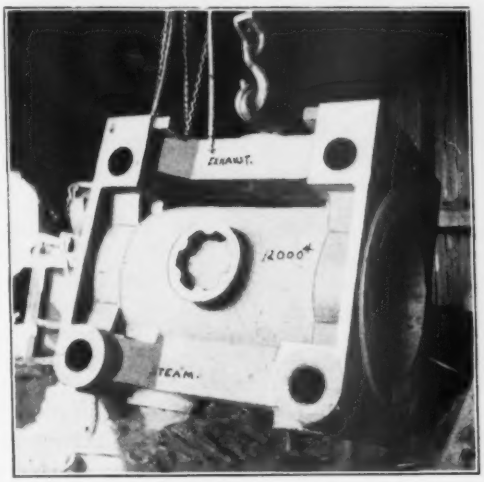


FIG. 2.—CYLINDER CASTING.

of these flasks. In it, strength, regardless of weight, has been the one consideration. As the total weight of the cylinder is 12,000 pounds, it is very essential to have a strong flask that will resist the pressure of the metal when the mold is being poured. A rigid flask will always insure a casting true to the pattern if the mold is properly rammed, but a properly rammed mold in a weak flask will very seldom produce a casting true to the pattern. No. 6 Shows the arbors used to support the main bore core. These arbors are placed in the main core box on a layer of sand and rammed up. No rodding is necessary when such an arbor is used, and the rigidity of the arbor insures a core true to the form of the box and also prevents the sagging of the core when it is green. Fig. 2 shows the finished casting.

A large number of these cylinders are made every year, and although they are all cast horizontally we have never experienced any trouble from dirt in the bore or any other part of the casting.

CORRESPONDENCE.

Inquiry:—I am desirous of casting steel gear wheels in a chill, and would like to know a mixture that will run very free and tough and not too hard to anneal well when taken from the chill, also an iron mixture for the same purpose.

Answer:—A steel mixture that will not give trouble when cast in a chill, and could be used without annealing is a very difficult proposition. I would say that the carbon should be kept as low as possible, say .20, the manganese below .35, the phosphorus as usual, the sulphur very low, say .04, and the silicon .25. If the castings are removed as soon as they have set sufficiently they may anneal sufficiently from their own heat to cause little trouble in the machine shop.

An iron mixture for the same purpose would mean as high silicon as can be without weakening the result. Let us say silicon 2.50 percent, manganese less than .40, phosphorus less than .500, sulphur less than .05. Here we would have iron which cast into sand would be too high in silicon for the purpose, but in chills it is necessary to do this. For the cupola mixture add .25 silicon, to allow for the burning out.

Inquiry:—I am a subscriber to *The Foundry* and saw Walter H. Wangelin's Method and Table for calculating mixtures of iron by analysis. I failed to understand his method in some parts. I want to mix four brands of iron. The different brands containing the following percentages: The first, 5 percent of silica; the second, 2.50 percent of silica; the third, 1.80 percent silica; the fourth, 2.00 percent of silica, and scrap iron containing 3.00 percent of silica. I want a mixture of 3.00 percent silica and desire to use as much scrap as I can so as to obtain the mixture. I would like to have you show me how to find the number of pounds of each brand required.

Answer:—Our subscriber must make up his mind how much scrap his work can stand, as with the irons in question he can make any mixture he likes, the 5 percent material always helping him out. Let us sav he selects 60 percent pig, and 40 percent scrap, which ought to give him as high a scrap contents as would be safe. For every 1,000 pounds of the charges, he would then have 400 pounds scrap, with 2 percent silicon, or 8 pounds silicon.

Now he will probably have to use as little of the 1.80 silicon as he can, so as not to have to add too much of the 5.00 silicon material. Say he takes 10 percent of the mixture, or 100 pounds. This would mean 100 pounds iron with 1.80 percent silicon, or 1.8 pounds silicon.

Now he wants 3.00 percent silicon average in the mixture, which means 1,000 pounds with 3.00 percent silicon, or 30 pounds silicon. He therefore has already 500 pounds in the mixture with 9.8 pounds silicon he needs 500 pounds with 30—9.8, or 20.2 pounds silicon which would mean iron averaging 4.00 percent, which would show that the 2.50 percent must be mixed with the 5.00 percent brand in sufficient quantity to give the desired result. It will be readily seen that it takes more than half of the 5.00 percent to do this, as the average of the 2.50 and the 5.00 is 3.75 percent or short of the desired 4 percent. Taking the 2.50 percent iron at 225, and then 200 pounds while the 5.00 percent material is at the same time 275, and then 300 pounds, we see that the latter case covers the issue, and we have the whole mixture as follows:

			Pounds Silicon
400 pounds	Scrap,	2.00 percent Silicon	8.0
100 pounds	Pig,	1.80 percent Silicon	1.8
200 pounds	Pig,	2.50 percent Silicon	5.0
300 pounds	Pig,	5.00 percent Silicon	15.0
1000 pounds			29.8

or the silicon in the mixture is 2.98 percent, which is near enough. The process to be followed in all calculations of mixtures is to settle upon the quantities to be used for all but two of the ingredients. Then these two are varied to come out just right. Usually the scrap is a matter of stock on hand, and ability of the castings to stand much or little. Then the other irons are used according to the stock on hand, or their purchase price.

AN EMERGENCY BRASS FURNACE.

While visiting a small repair shop and foundry recently, the writer saw a small brass furnace that was characteristic of the place. They started to build a furnace for using crude oil as fuel, but before the furnace was completed a hurry-up order came in for a heavy brass casting. There was not sufficient time to send to the nearest foundry, so a half finished furnace was hurried into condition for a coal fire and charged. An air pipe for furnishing blast to the furnace had already been placed in position and the shell was simply placed over this and lined with fire brick, the

fire was started and anthracite coal packed about the crucible. The blast was then turned on, and in an unusually short time the metal was ready to pour. The results were so satisfactory that all thought of further improvement was abandoned and the furnace is still in use as it was so hurriedly pressed into service. A description of the construction of the furnace may be of interest to others who require some device for melting small quantities of brass occasionally. Fig. 1 shows a section of the furnace. It consists of an outer shell A lined with fire brick as shown at C. The bottom of the furnace is all composed of fire brick. The cast iron cover F is provided with an iron handle G. The products of combustion escape through nicks cut on the edge of the brick work as shown at H. Dimensions are shown on illustration. The blast is taken from a small centrifugal blower which supplies the blast for the forges in the smith shop and is introduced through a one and one-quarter-inch pipe shown at G. This pipe extends about four inches above the bottom of the

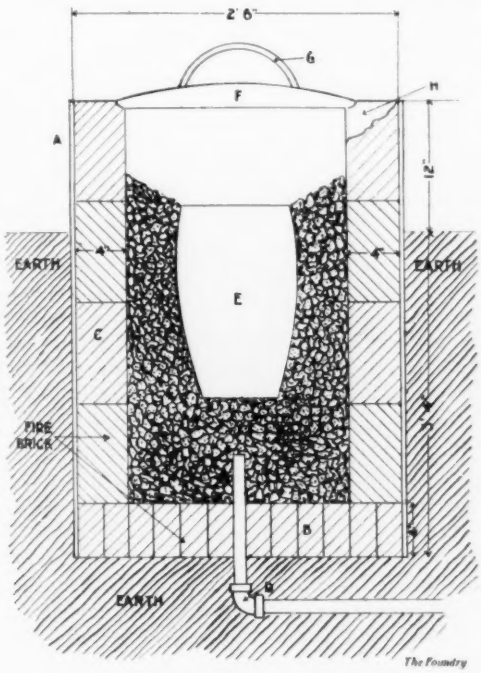


FIG. 1.—AN EMERGENCY BRASS FURNACE.

furnace. The fuel consists of anthracite coal of about grate-size. A bed of about 8 to 12 inches thick, depending upon the charge to be melted, is placed in the bottom of the furnace and the crucible E, set on top of it; coal is then filled in around the sides of the crucible up to the top as shown. Fig. 2 shows the general appearance of the furnace as installed in the shop. The crucible can be seen standing at the right and the cover at the left.

FIG. 2.—AN EMERGENCY BRASS FURNACE.

Charges of from 200 to 350 pounds can easily be melted in this furnace and by having a second crucible charged ready for introduction into the furnace as soon as one is removed, it is possible to melt from three to four charges in succession. In the latter case the coal filled in about the first crucible falls down to form the bed for the succeeding one. C. B. A.

MALLEABLE IRON STOVES.

BY JOHN MAGEE.

For some months past the stove trade has been much amused by a series of articles and comments on the use of malleable iron in the stove trade which have appeared in the trade journals. This discussion was started at the Milwaukee convention of the American Foundrymen's Association, and was given additional impetus by an editorial in the *Iron Age* under date of June 18. It is hard for any one conversant with the need of the stove trade to imagine anything more unsuited for the construction of a modern high grade range, than malleable iron and it certainly is not "making distinct headway in displacing gray iron" as is stated by one writer.

For small handles, shakers, knobs and fittings there is nothing better than malleable iron but this is an extremely small and limited use and there are many large difficulties in connectio with the construction of a malleable iron range. The sale of the steel range with a malleable top has had a sporadic growth in certain sections of the country, at various

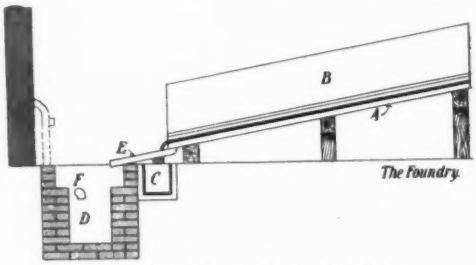
times, but has never lasted after the true worth of the goods has had a time to show itself. The fact that a malleable stove top may be struck with a sledge without breaking is enough to make sales in some districts that have had no experience, but after a short time when the material has had time to become deeply pitted with rust; when the poor fit of the parts, not so apparent in new goods has had time to show itself; as the joints have been thrown out of alignment by expansion and contraction and when repairs have been ordered and it has been found that they do not fit well, then there is a strong reaction in favor of gray iron goods.

The only fact that recommends malleable is its strength. It will not radiate heat as easily as gray iron; it cannot be made to maintain a uniform size in the finished casting so that there is no guarantee that repair castings will fit after they have been annealed; the annealing process destroys any fine finish that the casting may have had; and malleable rusts more readily and pits more deeply than gray iron. In short with the one exception of strength it is impossible to imagine anything more unsuitable for range construction on account of excessive cost, the difficulties of manufacture, the poor finish and wearing qualities. Some of the articles that have appeared hail malleable iron as the ideal stove material of the future, but those that are conversant with the facts of the case know the fallacies of this view.

PICKLING BED AT THE REED FOUNDRY, WORCESTER, MASS.

BY J. S. LANE, M. E.

A good idea of this bed is given by the accompanying illustration. The bed A is 14 feet 6 inches long and 5 feet wide. It is made of 2-inch plank, covered with ¼-inch sheet lead over which are placed two layers of 1½-inch hard wood boards, breaking joints so there is no possibility of the lead being injured by the castings. A wooden back, B, about 4 feet high is placed at one side of the bed, so that castings can be piled against it. The bed has a slope of about 2 feet in its length. The pickling solution is contained in a lead-lined tank C, which is 14 x 14 x 42 inches inside. Tank C is provided with a drain pipe (not shown) by means of which it can be drained into tank D. The tank D is made of brick and lined with cement. It is 30 x 72 inches inside. The overflow pipe is placed at F and its end turns down into the tank like a syphon. It does not act as a syphon, but is simply intended to prevent sand from entering the sewer. As the sand accumulates at the bottom of the tank D, it is removed with a long handled shovel. A removable apron E, made of 3-16-inch steel and well coated with asphaltum paint on both sides, is used for carrying wash water from the bed A to the tank D. The castings are piled



PICKLING BED AT REED FOUNDRY.

upon the bed, the apron E removed and placed against the wall as shown by dotted lines at the left, the pickle is dipped from the tank C by a long handled dipper and poured over the castings, any surplus fluid being allowed to flow back into the tank. When it is desired to wash the castings, the apron E is placed over the tank C and wash water played over the castings by means of a hose. This carries most of the sand and scale into the tank D.

TINNING CAST IRON.

When castings are to be tinned, it is first necessary to remove all sand and iron oxide from the surface of the castings. Sometimes the castings are pickled in hydrofluoric acid, but it is best to clean them with sand blast. Sometimes simply tumbling is sufficient to clean the surfaces; after tumbling, the castings are sometimes put in a pickling bath made up of one part of hydrochloric acid to four parts of water in which they are allowed to remain from one to two hours, or until the sand and scale are all loosened. Any spots or corners are then finished with a wire brush, scraper, or old file. The castings should then be washed in hot water and dried, after which they are dipped in a flux dip composed of four parts of a saturated solution of sal ammoniac in water and one part of hydrochloric acid. The bath should be hot. The castings are then dried, after which they are dipped in a pot of melted tin. The tin should be hot enough to bring the castings quickly to its own

temperature and still remain perfectly fluid, but not hot enough to cause the surface to oxidize badly. Sometimes the surface of the tin bath is covered with powdered sal ammoniac, at other times a little tallow or palm oil is added to the surface. After the castings are removed from the tin, they are generally allowed to cool, though some dip them in a second bath of tallow or palm oil kept at a temperature slightly above the melting point of tin; the idea being to allow the excess of tin to drain off. As soon as the tin on the castings has chilled or set, they should be washed in hot soda water and dried in sawdust.

RECENT PATENTS.

Mold Materials.—Patent No. 729617 to C. W. Link, of Jersey City, N. J., describes a method of treating "shore" or other sand to obviate blowing and ensure clean surfaces. A vegetable oil, as corn or linseed, and a smaller quantity of a hydrocarbon oil, such as refined high test kerosene, are mixed and sprayed upon the sand, half of which may be old sand, and mixed as usual. The preferred proportions are silica 99, vegetable oil ¾, hydrocarbon oil ¼. It is chiefly for cores.

Another core composition is dextrine 90, silica sand 10, mixed with molder's sand in the desired proportion. The use of flour, molasses, etc., is obviated by this. No. 729637, E. E. Myers, of Akron, Ohio, patentee.

A composition evidently intended to take the place of plaster of paris in fine molding invented by Paul Würtz, of Hoboken, N. J., 742109, consists of Keene cement 7, pulverized asbestos 2, infusorial earth ½, pulverized caput mortuum ½. The last is red oxide of iron remaining from the distillation of sulphid of iron in the manufacture of fuming sulphuric acid. It is poured over the pattern and after drying has to be fired.

Flasks.—An extensible flask is the subject of patent No. 726290, to J. W. Hoefers, of Chicago. The sides and ends of cope and drag are made up of sections, between which extension pieces of any desired size may be inserted. They are mortised into each other—to enable any one to fit in any place, and are held together by bolts. No expense seems to have been spared in the construction of the device. The usual advantages of extensible flasks, saving in number of flasks, time taken in hunting up the right one, space, etc., are claimed.

No. 728011 relates to the casting of bath tubs and is one of the series of patents recently taken out by J. C. Reed, of Allegheny, Pa. The tub is cast bottom up and the cheek part of the flask has sloping walls to conform to the general shape of the tub, but the sprues are formed in offsets having vertical walls. The cope is formed in the same way. The object is to decrease the size and weight of the flask and mold.

W. J. Ball of Leetonia, Ohio (726242) has a flask pin used with a V-shaped guide and adjustable on an inclined surface on the flange of the cope. It is secured by a bolt passing through the flange and pin and a lever having an inclined faced or spiral disc on its inner side.

E. Harrold and C. G. Wilderson, of the same place, have invented a simpler one (No. 735503). At the top of the pin is a head having a spiral cam face on top and a horizontally projecting lever. It can be turned by the lever so as to become wedged into the slot provided in the flange on the cope for that purpose. It is obviously very easily put in even when worn.

Foundry Sundries.—C. T. Pratt, of Frankfort, N. Y., has patented a chaplet and pattern (No. 735147). The pattern is provided with an opening to receive the end of the chaplet, which may be bushed. The chaplet has the common plate on the outer end and the wire shank is bent to form a shoulder at the point of separation between the mold and pattern, which serves to locate the chaplet and support it on the pattern in making up the mold.

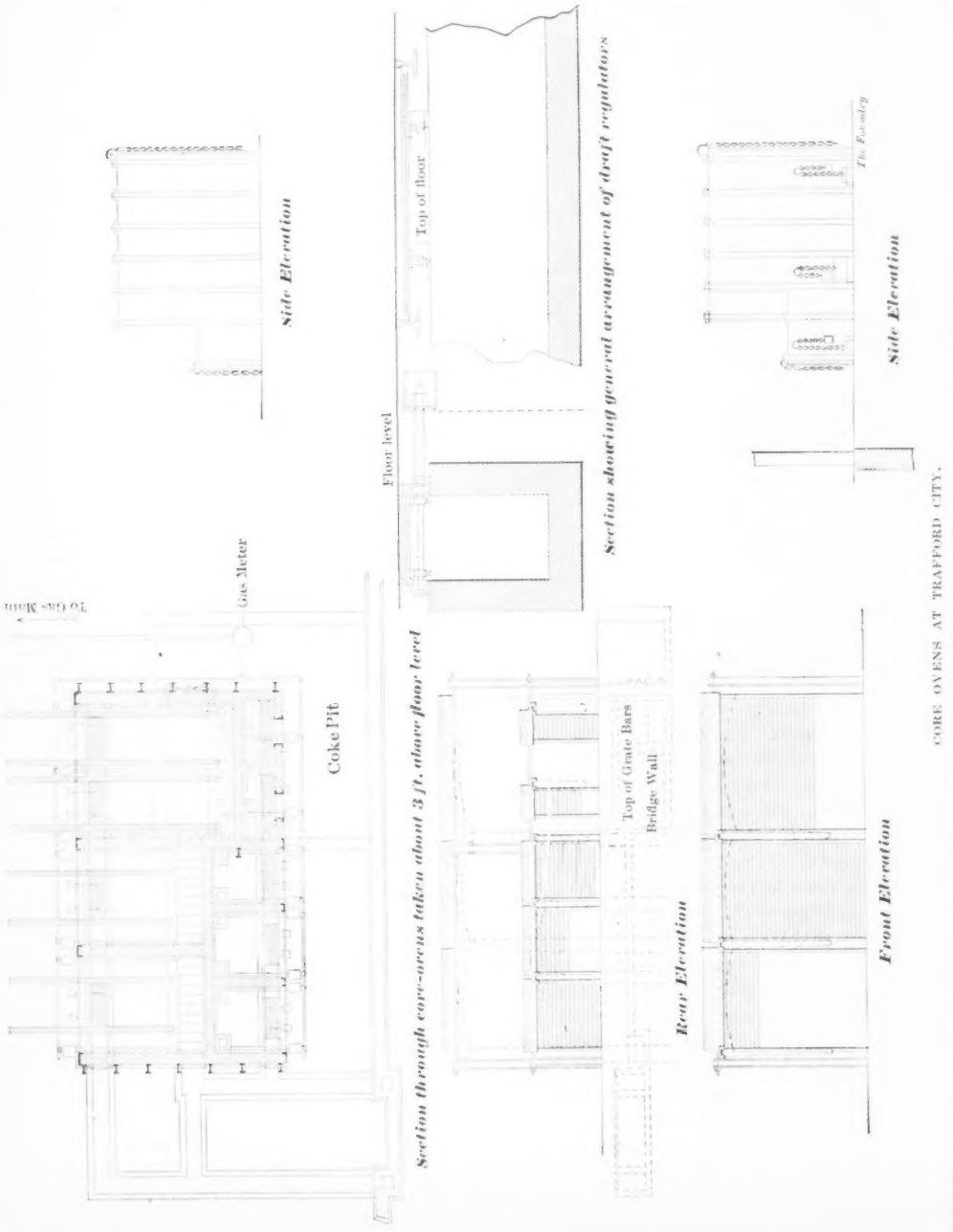
A. G. Shmidt, of Springfield, Ohio, has patented a molder's sponge (No. 735158) made up of waste pieces of sponge or other absorbent material capable of retaining water until squeezed out, held in a porous cover formed pointed or cone shaped, so as to easily direct the water to the desired points.

F. H. Arnold, of Reading, Pa., has a gate pattern for keeping back the dross and dirt while the metal runs into the mold. The main gate pattern has several branch gate patterns extending obliquely downward from it to the mold, each one having a shoulder on its upper face, and a curved end extending obliquely downward from the shoulder toward the base to form a reduced outer extremity. The number of the patent is 731738.

The Marinette Gas Engine Co., Chicago, Ill., has been incorporated with a capital of $250,000. The incorporators are: E. D. Fraser, H. S. Keeler, George Burry.

CORE OVENS OF THE WESTINGHOUSE MACHINE CO., TRAFFORD CITY, PA.

The foundry of the Westinghouse Machine Co., Trafford City, Pa., contains two large core ovens between which the core department is located. Each oven is divided into eight compartments. The fronts of the ovens, or rather those compartments opening into the center foundry span, are subdivided into three compartments for drying the larger and heavier cores. One of these compartments is 18 x 18 feet, while the remaining two are 11 x 16 feet. Large steel trucks or buggies are arranged on tracks so that they can be run into and out of the ovens. These trucks carry racks for supporting the cores. When the



CORE OVENS AT TRAFFORD CITY.

trucks are to be drawn out of the ovens, a chain is attached to the truck, passed under a pulley and attached to one of the cranes in the center span. The backs of the core ovens are divided into five compartments, three being 10 x 18 feet and two 5 x 18 feet. Each compartment is provided with a Kinnear rolling door. The ovens can be fired either by coke or gas as shown in the accompanying illustration. Each compartment is connected with two flues, one for permitting hot air to enter and the other for carrying away the cooler air and vapor which arise from the drying cores. The general arrangement of the ovens is shown very plainly in the illustration. The volume of air entering each compartment can be easily regulated by adjusting a special grate or damper through which the hot air enters. This damper is placed between the rails of the track and is shown in detail in the illustration.

Chicago Foundry Foremen's Association.

On Oct. 29, in Chicago, about twenty of the foundry foremen met at the Grand Pacific Hotel and organized a local branch of the Associated Foundry Foremen. The following officers were elected: C. E. McArthur, foreman of the Western Electric Co., president; M. C. O'Connor, foreman of Allis-Chalmers, vice president; H. J. Holmes, foreman of Brown Bros. Mfg. Co., secretary; Jno. Balkwill, foreman of Davis & Ludwig Foundry, treasurer; E. Welsch, foreman of Bolter & Sons Foundry, sergeant-at-arms. The membership starts out with twenty-two, and they hope to enroll all of the foundry foremen in Chicago engaged in both brass and iron work before giving up the campaign. A committee on by-laws was appointed.

The Use of Waste Coke.

At the meeting of the American Foundrymen's Association in Milwaukee this subject came up for discussion. Mr. Best stated that he had secured good results by mixing the waste coke with the coal and putting it into the cupola; Mr. West said they used all their waste coke for blacksmith fires; Mr. Gilmour said that more of this waste coke could be used in large foundries than in small ones. To use it in the cupola is liable to clog it up. One member said they disposed of it to families for domestic use in their stoves. Since the meeting another use had come under our notice, that is, in connection with the stoves for drying molds. These stoves can be fired with the waste or broken coke to good advantage.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

A Hard Iron Mixture.

A maker of very thin castings used coke for melting which contained 1.25 percent sulphur, but used chiefly No. 1 pig iron, because they could not make small toy work soft with any other, and yet reported the castings almost white and having a very high shrinkage. They were advised to use a silvery iron as a softener and yet the castings did not respond. At last it was found that they melted pig alone for the last part of the heat from which they poured the work that had to be tooled, and made the first part of the heat wholly of sprues from the day before. The melting of these sprues over again with the high sulphur coke turned the castings nearly white. With the best of coke it would be impossible to remelt very light sprues and get soft castings, especially at the first end of heat. The only way is to mix the sprues and pig so as to get rid of all sprues each day and use a coke that will make soft iron.

A firm in Newark, N. J., once got quite a reputation for very soft castings which they sold at a high price. They used all No. 1 and No. 2 pig iron, and sold all their sprues for junk.

Shrinkage and Silicon.

"Please tell us what percentages of silicon correspond with the various shrinkages of a test-bar?" Any chemist will tell you that a given percentage of silicon will not always insure a definite physical structure. In the case referred to in the note just above the presence of sulphur or the remelting of very thin scrap, gave very high shrinkage, and yet the silicon was nearly the same as in soft castings with no shrinkage made the day before. If a definite percentage of silicon will not always produce the same shrinkage then the converse is true; that is, the same measure of shrinkage does not always indicate the same percentage of silicon in the casting. The same shrinkage accompanies the same quality of castings. We, therefore, say that shrinkage indicates the influence that a certain percentage of silicon is expected to exert. Under normal conditions the following amounts of shrinkage would be expected to correspond with the percentages of

silicon given: shrinkage .183 = 1.00 percent silicon; shrinkage .171 = 1.50 percent silicon; shrinkage .159 = 2.00 percent silicon; shrinkage .147 = 2.50 percent silicon; shrinkage .135 = 3.00 percent silicon; shrinkage .123 = 3.50 percent silicon.

Best Mixture for Grate Bars.

It is strange that it is about impossible to find any one who can give a mixture that will stand contact with burning coal. One founder says he at one time made a great many grate bars, and that one mixture seemed to stand about as well as another. One German metallurgist recommends sulphur .03, phosphorus .70, carbon 2.90, silicon 1.80, manganese .60. A chemist in one large foundry stated that he would not wish to go on record, but that sulphur, phosphorus and silicon should be low as possible and yet have nearly all the carbon in the graphitic form and the carbon should be very high. He says that this will stand the expansion and contraction by heat the best. Such an iron would have an open structure, but the harder irons crack and flake so badly as to be practically useless for exposure to burning fuel. We all would like to hear from some one who has had actual experience in this matter.

Shrinkage Cavities.

I also asked the same chemist for a remedy for a shrink or spongy spot in a casting and in fact the surface of the casting had shrunk away and left a smooth hole quite deep. I had suggested the use of a chill to set the surface before the fluid interior could shrink away. The chemist says that the carbon is too low for a casting that varies considerably in thickness. Such shrinkage generally comes from the low carbon which accompanies high phosphorus or high silicon iron. He suggests about 2.50 percent silicon, .4 percent phosphorus, .6 percent manganese and as high carbon as possible. It might be possible to overcome the trouble by using ferro-manganese in the ladle which would raise the carbon.

The other day a founder came to me and stated that he had a laboratory and analyzed all of his iron, coke and castings. He said that his silicon was just right, but his castings cracked, were hard and had shrink holes over heavy places. I advised him to increase silicon until he stopped the cracking and had made the iron soft, and also to add cast iron borings until he stopped the shrink holes. In a week he called to say that he had done so and that all was perfectly satisfactory.

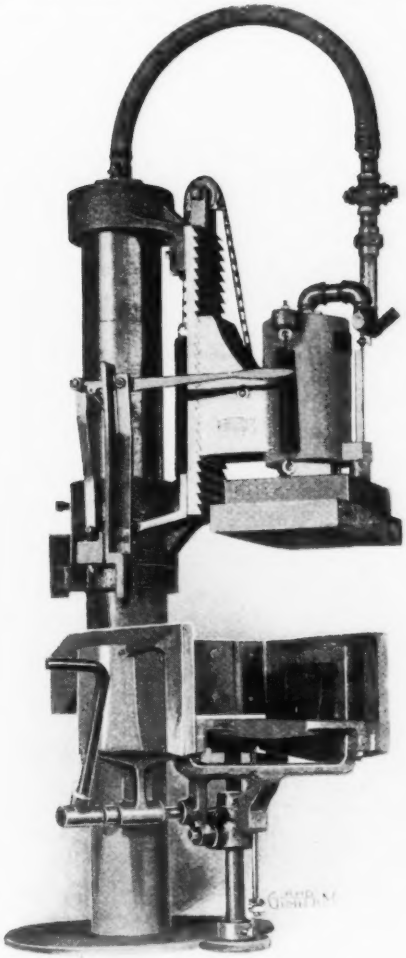
A few months ago I was called on by a founder who was in the care of a chemist. He said that his silicon was 2.04 and that his last cast was nearly all white, and that he had lost over $2,000 in bad castings in a few months and all from white iron. He would not increase silicon because he was told that he had the right amount for his work.

Hard Iron in Another Foundry.

We are having the devil's own problem with our foundry in our endeavors to get soft iron. Our steps thus far are as follows: We determine in advance from the best advice that we can secure the kind of pig iron that we ought to secure. We then buy on specifications and when the iron is received, we analyze it and refuse to accept it if it is below the grade. We measure shrinkage and we test for hardness by drilling and analyze the drillings. Our trouble is we cast both very small and very large work, and the mixture that is good for the little fellows is no good for the large ones. What would be your opinion of using high silicon pig (which would make the iron weak) mixed with 5 percent to 10 percent of wrought iron turnings, or even as high as 20 percent (thus making the iron strong)? Would it stay soft? Would it be strong?

Answer: All that you are doing is correct. We are not quite certain whether or not you know how to make iron soft with silicon. First use coke or coal for melting that does not contain over three-quarters of 1 percent sulphur—never more than 1 percent. If you use limestone for flux be sure that it is free from sulphur. After this as you increase silicon you soften your iron. It makes no difference where you get your silicon, whether in your pig iron or by using a high silicon iron. Of course, we suppose that your pig iron is normal in other elements and contains over 3.25 percent carbon for it is the carbon that the silicon acts through, and if carbon is low it will take more silicon to do the softening, and with 2.25 percent carbon silicon would hardly soften it at all, but ordinary pig iron is generally all right. As you increase silicon you decrease shrinkage and soften and vice versa. If you have heavy work make up enough changes for this work and run them first, make the rest of the changes suitable for the light work. As the iron changes from hard to soft there will be some chance of not getting what you expect, and this portion of the melt should be poured into work that is not very particular. In this way the last iron will be very soft and will run the light work.

If you wish to increase the strength of your heavy castings you can charge wrought iron or steel turnings, using from 5 to 20 percent. The best strengthener is *cast iron* borings—although I have told how to use these a great many times, I will do so again. Make from cheap cull lumber a quantity of boxes that will each hold 100 pounds of borings. Fill



A NEW MOLDING MACHINE.

these boxes with borings free from rust and dirt. Nail on the covers and pile the boxes in a dry place on the cupola scaffold. Charge one box with each ton of iron charged, and if after a trial you need more, double the amount. The boxes do not burn in the upper part of the cupola, but when they have reached the melting point are reduced to charcoal, and as this burns the borings melt; this makes the grain of castings very close and soft. It also prevents honeycombing and sponginess at the center of large castings and saves a good deal of money.

Treat wrought iron borings in the same way, only remember that they will harden castings and sometimes will not strengthen as expected, but generally the results are very satisfactory. You should use silicon iron in all cases to soften a pig iron mixture.

A NEW MOLDING MACHINE.

A new type of pneumatic molding machine has recently been brought out by the J. W. Paxson Co., and is shown in the accompanying illustration. One of the principal features claimed for the machine is its economy in floor space. As will be seen it is composed of a heavy vertical standard made of wrought iron carrying the head and pneumatic cylinder for operating the ram and most of the working parts of the machine. Below there is a table for supporting the mold and operating the stripping plate. Any number of tables up to four may be arranged about the column and the head swung around to operate over any of the tables. After the mold is rammed the head is swung out of the way leaving the space above clear. The ram can be adjusted for any depth of flask by loosening the clamp bolts and raising or lowering the head after which it is bolted to the V notched rack once more. Adjustment for wear has been provided for and the machine is said to be adapted to a greater variety of work than any thus far brought out. A new style of vibrator, the stroke of which can be regulated to suit the requirements, can be used, or it can be operated as a stripping plate machine. In swinging the cylinder away from over the mold the supply of air is automatically cut off, thus insuring freedom from accident.

PERSONALS.

Mr. Chas. Ashurst, who has had charge of the R. Hoe & Co.'s foundry for the past ten years, resigned his position the first of October to take charge of the erection of a new foundry for Fuchs & Lang, printing press manufacturers, at Rutherford, N. J. Mr. Ashurst was given a surprise by his men before leaving. Three of his men called upon him and asked him to go somewhere with them. They took him to a hall, where about 75 persons, all former workmen employed in the R. Hoe & Co.'s plant, were present. He was seated at the

head of the table and then John Kells, who acted as chairman of the festivities, stood up and told Mr. Ashurst what the guests thought of him. The speech was very complimentary, and at the end Chairman Kells handed Mr. Ashurst a gold watch as a token of the esteem in which he was held by his former fellow workmen. It was some minutes before Mr. Ashurst could reply, and then he thanked the men for the hearty support they had given him while among them.

Mr. Hilditch is to succeed Mr. Ashurst as foreman of the R. Hoe & Co.'s foundry at Manhattan, N. Y.

Mr. John Calder, who has been with the C. W. Hunt Co. as executive engineer, left them on Nov. 14 to assume a similar position with the Remington Typewriter Co. Before leaving he was treated to a pleasant surprise. Before noon a number of the members of the company gathered around his desk, and after appropriate words, presented him with a handsome loving cup as a mark of their esteem. Mr. Calder made a brief speech, thanking them for the gift and expressing his regret for having to leave such good associates.

Mr. Robert O. Cumback, for several years with the C. R. R. of New Jersey, has accepted the position of superintendent of the new plant of the Pedrick & Ayer Co., located at Plainfield, N. J.

Mr. I. F. Webb, of Collinwood, O., who was severely burned by the explosion of a crucible nearly two months ago, has practically recovered and expects to resume his work in a few days.

Oliver Phelps, general manager of the Lorain Foundry Co., Lorain, O., was given a gold watch, chain and charm by the employes of the company on Oct. 27 as an expression of the cordial relations which have existed between the management and employes at this plant. On Nov. 1 Mr. Phelps' resignation takes effect and he becomes M. A. Hanna & Co.'s sales agent at Detroit for the output of the Detroit Iron & Steel Co.'s furnace.

Mr. F. S. Caldwell, formerly of Cincinnati, has accepted a position as foreman of the foundry department of the Union Steam Pump Co., Battle Creek, Mich.

Wm. Miller, of Granite City, Ill., has been appointed manager of the Sharon works of the American Steel Foundries, succeeding S. A. Wallace, transferred to Alliance, O.

Mr. W. H. Thayer, who has been in the foundry business at Atchison, Kan., for the past 20 years, has retired from business and turned the concern over to his son, W. A. Thayer.

Mr. Wm. Hanson, formerly with the Pennsylvania Iron Works Co., Philadelphia, Pa., has resigned his position and accepted the position of superintendent of the foundry department of the Canada General Electric Co., Toronto, Canada.

DEATHS.

Mr. Alfred C. Toulmin, assistant superintendent of the Youngstown Foundry & Machine Co., died from an attack of typhoid fever at his residence on Nov. 3. Mr. Toulmin was 31 years of age and one of the most prominent young manufacturers of the city.

Patrick Dunn died Oct. 17 at the home of his daughter, Mrs. A. E. Dickinson, in Chicago, Ill. Mr. Dunn was a resident of Springfield, O., and was a stockholder in and employe of the Masts Foundry Co., of that city. He was visiting in Chicago at the time of his death.

Clinton Burnham, president of the Clinton Burnham Foundry Co., died in Milwaukee on Oct. 28. He was 42 years of age and had always been in active business in Milwaukee. His early life was spent in the manufacture of brick, but when his company was sold out to the trust in 1899, he organized the Clinton Burnham Foundry Co. and was at the head of it until the time of his death.

David Haas, for 30 years owner of a machine shop and foundry at Shamokin, Pa., died on Oct. 23. He was 63 years of age.

Mrs. Louise C. Bartlett, president of the firm of A. F. Bartlett & Co., Saginaw, Mich., machinists, founders and galvanizers, having one of the largest industries in Saginaw, died Oct. 26, aged 60 years. Mrs. Bartlett was also actively interested in a number of other industries and was perhaps the most prominent business woman of the city.

FIRES.

S. B. Stine & Son's foundry and machine shops at Osceola, Pa., were partially destroyed by fire. Loss, $10,000.

The plant of J. K. Petty & Co., Lebanon, Pa., consisting of boiler shop, erecting house, foundry, blacksmith shop, pattern shop, boiler shop and engine room, was totally destroyed by fire Oct. 18. The loss is $30,000, partially covered by insurance.

The machine shop of E. C. Colvin, of

Milton, Pa., was damaged by fire on the night of Oct. 29. The damage amounted to about $3,000.

The foundry and machine shops of S. B. Stine & Son, at Osceola, Pa., were practically destroyed by fire on the night of Oct. 20. Loss will amount to $10,000 and 50 men will be thrown out of employment until the plant can be rebuilt.

Love Bros.' Foundry & Machine Shop, Corry, Pa., was totally destroyed by fire Nov. 1, causing a loss of about $10,000.

The foundry at the old Ferry mill at the Diamond State Steel plant, Wilmington, Del., was slightly damaged by fire on Nov. 10. Fire was extinguished by the employes.

The foundry of Helmick Foundry Machine Co.'s plant, at Fairmont, W. Va., was damaged by fire on Oct. 27. The greatest loss was sustained through the destruction of its patterns. The loss will amount to from $4,000 to $5,000, which is said to be fully covered by insurance. Work of rebuilding will commence at once.

On Nov. 13 the casting foundry of the Pioneer Stove Co., which is located inside the penitentiary walls, Columbus, O., was damaged by fire to the extent of $2,000. The convict fire brigade did remarkably good work, the chief, Dick Frames, distinguishing himself. The city department was delayed owing to the fact that the special latch on one of the outside gates refused to work at first. There are about 30 convicts and 16 outside workmen employed.

The foundry of Wessling Bros., Cincinnati, O., was gutted by fire on the evening of Oct. 29. The damage amounted to about $1,500.

The H. P. Deuscher Co.'s shop at Hamilton, O., was slightly damaged by fire on the night of Oct. 24.

The foundry of Kelley & Co., Marengo, Ill., was damaged by fire on the afternoon of Nov. 16, damages amounting to about $500. It was covered by insurance.

The foundry of the Webster City Steel Radiator Co.'s plant, at Marshalltown, Ia., was damaged by fire to an extent of about $300 on the night of Oct. 21.

The foundry of Tomlinson & Sons, at Toronto, Can., was damaged by fire on Oct. 29. The loss is estimated as follows: On the buildings, $200; on the patterns and contents, $1,500, fully insured.

The plant of the Hamilton Brass Mfg. Co., Hamilton, Ont., was damaged by fire on the night of Nov. 11.

TRADE PUBLICATIONS.

"Mechanical Draft," published by the Buffalo Forge Co., Buffalo, N. Y. This is a neatly bound publication 7½ by 9 inches, printed on good paper, well illustrated and containing a general description of apparatus for producing mechanical draft together with data which are of use to engineers who have problems of this kind to solve. It is of interest to know that the data are not based on imaginary conditions, but so far as possible taken from experiments. The Buffalo fan heating, ventilating and drying apparatus, high speed engines, etc., are also illustrated.

The Cling-Surface Mfg. Co., Buffalo, N. Y., has published a neat little book entitled "New Knowledge on Belt Management." The book contains a number of photographs showing how belts can be run with the use of cling-surface. It also contains a short clear statement of the method of using cling-surface and its effect upon belts. This is followed by a series of statements as to actual results obtained; also some tables and charts illustrating graphically the advantages of the use of cling-surface. While this is a trade publication, it contains a great deal of information which should be of interest to all engineers.

The Joseph Dixon Crucible Co., of Jersey City, N. J., has issued a neat little pamphlet 4 x 8½ inches entitled "Graphite suggestions," in which it gives a few of the more important uses of Dixon's graphite. It is very neatly gotten up and gives valuable suggestions as to the use of the material which it manufactures.

Chicago Pneumatic Tool Co., Chicago, Ill., has issued a four-page folder describing their pneumatic hammers, drills, rammers, hoists, etc.

The United Telpherage Co., of 20 to 22 Broad street, New York City, has issued three small circulars numbered 36, 38 and 42, showing the application of its system of conveying in cotton and woolen mills for reserve coal storage, and automatic telpher plants. To those who have materials to be handled in large quantities from one portion of a plant to another, these pamphlets would be of interest.

The Buffalo Forge Co., Buffalo, N. Y., has issued two small circulars, 3½ x 6½ inches; one entitled "Mechanical Forced Draft," and the other "The Buffalo Steel Pressure Blowers." These publications are fully illustrated

and contain a considerable amount of valuable data as to the products manufactured by this company. The pamphlet on Mechanical Forced Draft contains a short discussion on the subject of Mechanical Draft versus Natural Draft. The pamphlet on Steel Pressure Blowers gives tables of capacities, speeds, dimensions, etc.

The Ingersoll-Sergeant Drill Co., of New York City, has gotten out a catalogue on Labor Saving Tools operated by Compressed Air, including air hammers, drills, couplings, etc. Detailed descriptions of their pneumatic devices are given, together with information which would be of interest to any user of this class of appliances.

The Logan Mfg. Co., of Phœnixville, Pa., has gotten out a neat folder, 3½ x 6½ inches, stating the advantages of its position and why it is able to furnish castings cheaper in the eastern part of the country. The folder contains halftones of its works and a map showing its location.

The Ingersoll-Sergeant Drill Co., of 26 Cortlandt street, New York City, has issued a new catalogue on Air Compressors, which it calls its temporary edition No. 24 B. It is the old catalogue with additions which bring it up to date and is to serve until it gets out a completely revised edition. It contains not only a description of all the styles of compressors which it builds, together with some information regarding other compressed air machinery, but a large amount of information in regard to the amount of compressed air required for various purposes and tables and data relating to air compression.

"Crucible Facts" is the name of a little folder issued by the McCullough-Dalzell Crucible Co., Pittsburg, in which it sets forth the reasons why its crucibles should be used.

NEW CONSTRUCTION.

A brick addition to be used as a foundry is soon to be added to the plant of the Phillips Insulated Wire Co., at Darlington, R. I.

The Providence Steel Casting Co., Providence, R. I., has let the contract for its new building, heretofore mentioned. The company was organized a few months ago, and will operate a foundry to be constructed upon a modern basis, 166 x 118 feet. It is expected that the plant will be in operation about Feb. 1.

The Ludlow Valve Works, Troy, N. Y., are making extensive additions to their plant. There are to be ten new buildings, including a foundry, 366 x 137 feet, all to be of brick. To facilitate the work the yard and buildings will be thoroughly equipped with a system of industrial railways. There will be a large outdoor and two indoor traveling cranes, two of ten and one of twenty-ton capacity. The present output of the company will be doubled. The new plant will be one of the most modern in the country. The present plant will be converted into a machine shop and finishing department. The officers of the company are: President, John T. Christie; vice president, James H. Caldwell; secretary, F. Merriam Wheeler.

The Dent Hardware Works at Fullerton, Pa., are going to build a new foundry and make some other additions to their plant.

The Raymond Mfg. Co., of Middletown, Pa., is so busy in its foundry department that it is compelled to build an addition, which will enable it to employ about 30 additional molders.

S. B. Stine & Son, manufacturers of mining machinery, Osceola Mills, Pa., will rebuild their plant recently destroyed by fire. It is the intention to rebuild on a much larger scale and make the structure as nearly fireproof as possible. The new foundry will be equipped with the latest modern machinery. The main building will be 140 x 40 feet, of tile, crane to traverse the entire length of the building. The foundry will have an output of between 15 and 20 tons of castings per day.

The Nazareth Foundry & Machine Co., Nazareth, Pa., is building an addition 28 x 78 feet, three stories, for offices and pattern and machine work.

The plant of the International Steam Pump Works, now in course of erection at Newark, N. J., will include a machine shop, 1,006 long by 123 feet wide. The main foundry will be 600 x 141 feet. The other building are a high erecting shop, 150 x 124 feet; erecting shop, one story, 60 x 123 feet; pattern shop, four stories; power house, 174 x 118 feet; machine molding shop, 400 x 68 feet; and a cleaning room, 200 x 60 feet. The works will give employment to about 3,000 men.

The Union Machine Co., Nashville, Tenn., has outgrown its present quarters on College street, and has decided to erect an additional plant in West Nashville. A tract of land on the Tennessee Central railroad has been purchased, and work will soon be begun on the

new plant. The machine shop will occupy a space 100 x 180 feet, and the foundry will be about the same size. The latest and best machinery will be installed. The company has been incorporated about five years, capital stock is $50,000 and it has $12,000 surplus.

The Wheland Machine Works, Chattanooga, Tenn., will make improvements amounting to $35,000. These will include a large foundry and machine shop, which will be erected early in the spring.

The American Casting Co. has applied for a charter with a capitalization of $20,000. It plans to establish a plant at East Birmingham, Ala., and to erect a foundry 50 x 150 feet and a machine shop, 60 x 80 feet, together with such other buildings as may be necessary. The plant will be for the manufacture of hardware specialties. The officers are: George H. Harris, president; H. V. Dimick, vice president; D. H. Dimmick, general manager, and J. E. Dow, secretary and treasurer.

C. W. Muholtz & Co., proprietors of the Dixie Repair & Machine Works, Bristol, Tenn., have purchased a lot, and will erect a building to be occupied as a foundry, machine, blacksmith and pattern shop. The Machine shop will be started by January 15. The company will make a specialty of repairing mining machinery.

Work on the new brick addition of the Ashland Foundry & Machine Works plant, Ashland, Ky., is being pushed forward rapidly.

The O. K. Stove & Range Co., Louisville, Ky., is having plans prepared for a new foundry to cost about $10,000.

The Helmick Foundry & Machine Co., Fairmont, W. Va., will erect at once the foundry and blacksmith shop recently damaged by fire.

The United States Malleable Iron Co. has secured a site at Toledo, O. The company was incorporated under the laws of West Virginia with a capital stock of $100,000. Robert C. Pew is president, Presley T. Craig vice president, and Walter H. Jeffrey secretary and treasurer. The main building is to be 75 x 320 feet with two L's each 50 feet in length. A pattern and machine shop, 40 x 70 feet, and a storage and office building will also be erected.

The new foundry of the Ashland (O.) Steel Range & Mfg. Co. is ready for the machinery and cupola, which are expected daily.

The Crawford & McCrimmon Co., Brazil, Ind., will erect a two-story building, 40 x 150 feet for offices and drafting rooms, and will probably build a foundry next year.

The Perkins Co., Grand Rapids, Mich., will construct a new foundry 50 x 80 feet. The building will be of concrete.

The Dowden Mfg. Co., Prairie City, Ill., will erect a foundry 42 x 62 feet.

The Colean Implement Co., East Peoria, Ill., has broken ground for a new pattern shop and foundry. The foundry is to be 50 x 120 feet, and the pattern shop 20 x 50 feet.

The J. E. Porter Co., Ottawa, Ill., started to work on the construction of a new fireproof foundry, 60 x 160 feet, north of the company's machine shop.

The Frances Nygern Foundry Co., Chicago, Ill., is planning to build a new foundry to cost about $25,000. The building will be 100 x 150 feet.

The Gem City Stove Foundry is erecting a large warehouse at Quincy, Ill.

The Capital Foundry, of Springfield, Ill., reports that its new foundry, 100 x 150 feet, is about ready for work. The new foundry is thoroughly equipped in every way, being provided with the Pawling & Harnischfeger traveling crane and a complete modern equipment in every respect.

Work at the Greenlee Bros. plant, Rockford, Ill., is progressing rapidly, and they will soon be ready to begin operations. The main building will be 160 x 400 feet, four stories. The foundry will be 160 x 500 feet, one story.

The Northwestern Malleable Iron Co., Milwaukee, Wis., is making improvements in its plant at the cost of $12,000.

Woodside Bros., proprietors of the Port Arthur Iron Works, Port Arthur, Ont., have decided to rebuild their plant recently destroyed by fire. Capacity will be doubled. They hope to be able to turn out work in their machine shop in two weeks and in the molding department in three weeks.

The Massey Iron Foundry Co., Kansas City, Mo., filed a statement showing that it had made an increase of capital from $100,000 to $200,000.

The Koch Mfg. Co., Des Moines, Ia., is carrying on the erection of its new foundry and hopes to have it completed before long.

A foundry building, 62 x 442 feet, will be constructed by the Dowden Mfg. Co., of Prairie City, Iowa.

The Waterloo Register Co. are planning to

build a new foundry at Waterloo, Ia. The officers are: President, W. L. Carter, Des Moines, Ia.; manager, J. H. Riley, Waterloo, Ia.; secretary, R. H. Gatiss, Waterloo, and treasurer, F. J. Eighemy.

A new foundry is to be built at Coeur d'Alene City, Idaho, to take care of the work of the Spokane & Coeur d'Alene Electric Railway. It will also carry on a general foundry business.

The Hoquiam Iron Works Co., Hoquiam, Wash., will enlarge its present plant and add a foundry. Considerable new machinery will be installed.

The California Iron Works Co., Eureka, Cal., has begun the erection of a building 60 feet by 110 feet, to be used as a machine shop and foundry.

It is stated that the Mexican Car & Foundry Co. will erect a car building plant near the City of Mexico with a capacity of 20 cars per day.

GENERAL INDUSTRIAL NOTES.

The New Castle Foundry Co., New Castle, Ind., which closed down in the spring on account of the strike, is securing men and making arrangements to start up again as soon as possible.

The Valley Wind Engine & Iron Co. has been organized in Bay City, Mich., with a capital of $75,000 to manufacture windmills and grain grinders, etc. The company already has a plant in operation at Brantford, Ont.

The addition to the foundry of the Hildreth Motor & Pump Co., Lansing, Mich., will soon be completed. The company has had a prosperous year, and has recently increased its capital stock from $20,000 to $30,000.

The Kells Foundry Co. has been organized at Adrian, Mich., with a capital of $80,000. The company expects to manufacture several special lines among which may be mentioned gas engines.

A number of notes of a damaging character concerning the financial condition of the Chicago Pneumatic Tool Co. have been going the rounds of the papers recently. Upon investigation it was found there was no foundation for these reports, and the president, D. J. Duntley, finally gave out a statement as to the financial condition of the company, which showed that it was in splendid condition and had good prospects before it for a continuation of the business in a highly prosperous condition. The company has no borrowed money, has money on hand to meet all obligations and a large surplus of assets which could be turned into cash quickly.

The George D. Hayden Machine Co., of of Alton, Ill., has been incorporated with a capital stock of $10,000. The incorporators are: George D. Hayden, William H. Hayden and Sarah S. Hayden. The company will do a machine and foundry business.

The Chicago plant of the Manitowoc Shipyard & Drydock Co. has been sold to Theodore Nodson, and hereafter the company will operate only its Manitowoc yard. The removal from Chicago is said to be due to the constant labor troubles there.

A receiver has been asked for the Bonnett-Nance Stove Co., Chicago Heights, Ill. The minor stockholders have asked for the receiver, claiming that John J. Bonnett and Richard W. Nance practically controlled the works to the exclusion of all others, that they borrowed money from relatives at exorbitant high rates, distributed fat salaries in the families and were arranging to squeeze the smaller stockholders out as rapidly as possible.

The buildings and equipment of the foundry and machine shop of the National Implement Mfg. Works, Polo, Ill., are being sold off by P. H. Coney, Topeka, Kan.

The new foundry of Turk Bros., Kankakee, Ill., collapsed on Nov. 11. Defective construction and a strong wind caused the walls to fall in. Loss, $5,000.

The Quality Stove & Range Co., Belleville, Ill., has been incorporated with a capital of $20,000 to manufacture stoves and ranges. The incorporators are: Louis Opp, Henry Ehret and George M. Jackson Jr.

The Turner Brass Works, Chicago, Ill., have increased their capital stock from $15,000 to $150,000, and the number of directors from three to five.

The Faunt Bros. have been incorporated at Chicago with a capital of $9,000 to manufacture brass castings. The incorporators are: R. C. Faunt, W. E. O'Neill and S. M. St. Clair.

The Reliance Iron & Engine Co., recently incorporated at Racine, Wis., will use the plant formally occupied by the Racine Malleable & Wrought Iron Co., consisting of two buildings, 64 x 164 feet, one for a machine shop and the other for gray iron castings. The capital stock paid in is $15,000. The incorporators are: John P. Davies, T. W. Thiesen, J. C. Hansen, George W. Gates, W. V. Johnson and Charles Felgenbauer.

At the annual meeting of the stockholders of the American Locomotive Co., held October 13, the retiring members of the board of directors were re-elected. The company reports a very prosperous year for the past year. The new management has succeeded in increasing the output of the various works greatly by introducing more systematic methods, and this has given them a substantial profit, which under the old management of the past would have been very much less.

The Wake Forest Foundry Co., Wake Forest, N. C., has been incorporated with a capital of $10,000 by John G. Dunn, S. P. Holding, W. W. Holding, J. L. Allen, and others.

The Peninsula foundry of Newport News, Va., will be removed to Phoebus, that State. The foundry belongs to the Sayre Bros.

The plant of the Southern Car & Foundry Co., at Birmingham, Ala., has been put in operation once more under the direction of the receivers.

Amended articles of incorporation have been filed by the Southern Foundry Co., of Frankfort, Conn., enabling it to increase its capital stock from $25,000 to $50,000.

The Hill & Griffith Co., of Cincinnati, O., is removing the machinery from its old plant to the six-story brick building corner Gest street and C. H. & D. railroad, Cincinnati, O.

The Zanesville Iron Co., Zanesville, O., has applied for a receiver, and the Guardian Trust & Deposit Co. has been commissioned to sell the plant and terminate the business. The capital of the concern is $100,000.

The foundry of the Lloyd Booth plant, at Youngstown, O., closed on the afternoon of Nov. 7 for an indefinite period owing to lack of orders. It is hoped that operations will be resumed at an early date.

The plant of the Forsythe Pattern Co., at Youngstown, O., was closed down Nov. 7 for an indefinite period owing to lack of orders. It was hoped that the plant would be started again in a week or two.

Young, Eberhard & Martin, Cleveland, have submitted to the city of Norwalk, O., a proposition to establish a plant for the manufacture of malleable iron castings. They ask for 40 acres of land and $100,000 in cash, and propose to erect two large buildings and employ 700 men. The Eberhard Mfg. Co., of Cleveland, is not connected with the enterprise.

The Universal Hinge & Mfg. Co., Cleveland, has been incorporated with a capital of $20,000. The incorporators are: H. L. Schneider, F. A. Richardson, Wm. L. Bullard, H. M. O'Malley and Thos. H. Penty.

A reduction has been made in the wages of the molders at the plant of William Todd & Co., which amounts approximately to 5 percent. Scarcity of orders is given as the reason.

The molders in all the foundries in the Mahoning Valley were notified of a reduction in wages to take effect Nov. 15, which will bring all the men close to the minimum of $3.00 per day. The reason given for the reduction was lack of orders.

The Springfield (O.) Foundry Co., which makes machine tools and heavy castings, closed its plant on Nov. 9 for an indefinite period owing to the lack of orders, and the Springfield Machine Tool Co., turning out the same line of product, is only running five days in the week on account of lack of orders.

The Terre Haute branch of the American Car & Foundry Co., employing 1,000 men, has closed down, and only repair work will be done.

The Dean-Waterman Co., Greenfield, Ind., has been organized to build gas engines, gas pumps and other machinery, with a capital of $20,000. The directors are: Morris B. Dean, S. Jewett Waterman, Thos. H. Newand and Archer G. Dean.

The New Albany Trust Co., assignee for the New Albany Stove & Foundry Co., New Albany, Ind., has filed its final report. The creditors will receive about 15 percent of their claims.

C. T. White, who until recently was manager of a manufacturing concern at Wabash, Ind., has formed a stock company which will be known as the Niles Foundry & Specialty Co., and expects to carry on a general foundry business at Niles, Mich.

The Toledo freight committee has received an application for a reduction of rates on pig iron to Indiana gas belt points. The committee will recommend to the Central Freight Association that the reduction be made.

The stockholders of the Malleable Iron Co., Muskegon, Mich., have elected the following directors: Dr. J. H. Belt, Cleveland; H. J. Sherwood, Cleveland; Thomas Hume, W. H. Mann and E. L. Howe, Muskegon. The directors elected the following officers: President, E. L. Howe; vice president, Dr. J. H. Belt; treasurer, Thomas Hume; secretary, W. H. Mann.

The Atlantic Stove & Mfg. Co., Boston, has been incorporated with a capital of $350,000. The incorporators are: Chas. A. Boynton, president; Jay B. Cranford, treasurer; and Henry E. Ruggles, clerk.

The George Miles Co., Winsted, Conn., has been incorporated to manufacture and deal in pneumatic specialties, air compressors, elevator drops, tubes, carriers, heaters, boilers and general iron work. Capital stock is $50,000 and the concern is to start on $10,000. The incorporators are: George Miles, of Hull, Mass.; Alfred Schoff, of Norfolk, N. J.; Martin Sauter, of Winsted; and Davis J. McSweeney, of South Boston, Mass.

The N. A. Lombard Co., Worcester, Mass., which manufactures molding machines, has gone into the hands of a receiver. A. H. Howard, of Worcester, Mass., was appointed as receiver.

An interesting souvenir, in the form of a description of the new plant, was presented to the members of the New England Foundrymen's Association on the occasion of their visiting the plant of the B. F. Sturtevant Co., at Hyde Park, Mass. This has been republished in the form of a 16-page pamphlet, entitled Bulletin 54.

The National Steel Foundry Co., recently organized in New Haven, Conn., has joined interests with the National Steel & Wire Co., of that city. This will add greatly to the strength of the foundry company, as it will place at the service of the foundry the extensive selling agencies of the wire company.

The property of the bankrupt New York Car Wheel Works, Buffalo, has been sold by the referee to Martin Carey, of Bissell, Carey & Cook, the bid being $155,500. Mr. Carey declined to state for whom he purchased the property. Joseph Berry, of Detroit, put in a bid of $152,000. Samuel Joseph, president of the Continental Iron Co., bid $153,000.

Mr. Geo. Sheldon, the new general superintendent of the Lackawanna Steel Co., of Buffalo, N. Y., entered upon the duties of his office Nov. 16. Mr. Sheldon will assume the duties performed by Vice President Reis since the resignation of General Superintendent Wehrum. The coming of Mr. Sheldon will allow Mr. Reis to give his undivided attention to the financial affairs of the company once more.

It is reported that the National Car Wheel Co., a combine which was formed to control the car wheel output, has broken up. Out of the nine car wheel companies that went into the combine, seven have withdrawn. The reason given is that they were not strong enough to control the market and the competition was too sharp, also the officers of the new combination wanted excessively high salaries.

The Monongahela Foundry & Forge Co., Philadelphia, has secured a contract for machine-molded castings which amounts to $140,000 a year and runs for five years.

The Southern Foundry Co., Owensboro, Ky., will build an addition, 45 x 75 feet, which will be used as a pattern shop and for the manufacture of galvanized iron. The company will spend about $10,000 in making necessary improvements and in the purchase of machinery. Everything will be in readiness to begin operations in the new department not later than Jan. 1. The company accepted the resignation of Mr. Freeman Little, president, and elected L. D. Baer. The other officers of the company are: Frank Katterjohn, vice president; M. F. Bransford, secretary; James Parrish, treasurer; J. M. Jorgeson, manager and superintendent.

The Automatic Valve Grinding Machine Co., Knoxville, Tenn., has been incorporated with a capital of $200,000.

A stock company, with a capital of $50,000, has been organized at Lexington, Va., to manufacture a new automatic airbrake for railroad trains, invented by J. P. Birmingham, of Lexington. The officers are: W. G. Matthews, of Glasgow, Rockbridge County, Va., president; Col. Robert Catlett, Lexington, secretary; J. P. Birmingham, Lexington; W. H. Partlow, Staunton; E. J. McCullough, Lexington; and J. P. Halsey, Lynchburg, directors.

The Cape Fear Machine Shops, Wilmington, N. C., has been incorporated with a capital of $100,000, to do a general machine work and operate a marine railway.

The Ironton Disc Plow Co., of Ashland, Ky., has leased the plant of the Ironton Foundry, and will put it in operation on its work exclusively. The foundry will be in charge of Chas. Alexander, for many years connected with the Foster Stove Co.

The American Pipe & Casting Co., with a capital stock of $20,000, has been incorporated at Birmingham, Ala. It has secured a site in East Birmingham and will erect a foundry in the near future. The incorporators are: Julian Dow, George H. Harris, Daniel Dimmick and Harry V. Dimmick, all of Birmingham.